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PROPAGATION OF WAVES IN ELLIPTIC DUCTS. A THEORETICAL STUDY.

by

S. Baskaran

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### **DEPARTMENT OF TRANSPORT TECHNOLOGY**

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#### PROPAGATION WAVES IN ELLIPTIC OF DUCTS. A THEORETICAL STUDY.

by

## S. Baskaran

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#### INTRODUCTION.

In recent years a considerable amount of work has been done on noise reduction in machines in general. In particular, attention of many workers in the field has been focussed on the noise reduction in jet engines, which radiate a high level of noise. In this context a study of sound propagation in cylindrical ducts assumes an understandable importance.

Propagation of sound in circular cylindrical ducts has been investigated extensively in connection with a jet engine compressor. It is important here to mention the work done by Tyler and Sofrin <sup>26</sup> which forms a basis for much work done in the field. They have shown that at very low shaft speeds a very high frequency noise is generated due to the interaction of the rotor blades and stator-vanes. Low frequency noise tends to attenuate exponentially in a duct; whereas high frequency noise propagates along the duct giving rise to spinning modes. These result in an annoying noise radiated from the open face of the duct.

From the noise control viewpoint, departures from circular symmetry of the cross-section of the duct evoke considerable interest. Elliptic duct intakes have been used in aircraft design, e.g. Boeing 727. Equations governing sound propagation in a duct of elliptic crosssection are quite well known.<sup>2,18</sup> Using elliptic cylindrical coordinates the wave equation separates into Mathieu equation and modified Mathieu equation. This has been discussed in the works of many authors, e.g. Chu (6), Jeffreys (13), Daymond (7) in connection with electromagnetic wave guides and oscillations in a lake with elliptic boundaries. However all work has been concentrated on the lowest order principal frequencies. These eigen frequencies decrease rapidly in the case of even solutions of the modified Mathieu equation for increasing eccentricity of the cross-section and increase in the case of odd solutions. It is, therefore, of interest to investigate the behaviour of these waves for higher order modes.

The pressure gradient normal to the duct wall vanishes under the boundary conditions that there are no reflections of the pressure fluctuations at the open end of the duct and that the duct is hard walled. This means the derivative, normal to the duct wall, of the pressure function is zero. The pressure function is a combination of Mathieu function and modified Mathieu function. Due to the continuity of pressure function in any particular cross-section of the duct, the solution are periodic. For a particular eccentricity, the eigen frequencies for various modes are obtained as the lowest parametric zeros of the derivatives of the modified Mathieu functions.

In a duct of circular section, the eigen frequencies are obtained directly as parametric zeros of the derivatives of the Bessel functions. But, in a duct of elliptic section, the eigen frequencies for the relevant eccentricities cannot be obtained in a straight forward manner. To obtain the eigen frequencies, a family of

- 2 -

ellipses of same area, say TT, are considered. For chosen positive increasing values of the parameter, the zeros of the derivative of the modified Mathieu function are found. From these the corresponding eccentricities and the eigen frequencies are computed. Then the eigen frequencies for the particular eccentricities are obtained by interpolation of the values already known.

For higher order modes, high values of the parameter have to be considered. Further the function has to be evaluated for these high values of the parameter. It is essential, therefore to check the validity and the rapidity of convergence of the various series expansions of the modified Mathieu function. The separation constant, which appears due to the separation of the wave equation, known as the characteristic value is tabulated in Blanch and Rhodes (5) for large values of the parameter. With the help of a computer program the coefficients for the series expansions for modified Mathieu functions are generated from these characteristic values. The zeros are then found and the eigen frequencies obtained as mentioned in the previous paragraph.

The eigen frequencies for ellipses of eccentricities .1 (0.1) .9 and 0.95 have been obtained for the integral orders 1-15 of the function, both even and odd. The eigen frequencies for even functions have been tabulated in Tables C and those for odd functions in Tables D. 1.1 The study of noise in a jet engine compressor may be broadly classified into three main divisions:

PROPAGATION OF WAVES IN CIRCULAR DUCTS.

1.

(1) generation of noise due to the movement of the rotor blades

(2) the propagation of the noise through a cylindrical duct enclosing the rotor bladesand (3) the radiation of the noise into free spacefrom the open face of the duct.

The work described herein is mainly concerned with the propagation of noise through elliptic ducts. Propagation in circular ducts has been described extensively in the literature. A brief review of the propagation in circular ducts (which lends itself more easily for analysis) will help in a better understanding of the more general case of propagation through elliptic ducts. 1.2 The noise in a compressor engine is generated mainly due to two causes.

(1) When the rotor blades move with given angular velocity, pressure fluctuations are caused at a blade passage frequency. These pressure fluctuations rotate with rotor angular velocity giving rise to harmonically related frequencies.

(2) Due to the interaction of rotor blades and stator vanes high frequency noise is generated when

(a) the wakes of upstream stator are cut by the rotor blades

(b) the rotor blade wakes are cut by the downstream stators

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and (c) the rotating periodic pressure field is interrupted by reflecting objects nearby.

These give rise to very high frequency noise even at low rotor speeds. The sound field so generated is allowed to pass through a duct of rigid walls enclosing the rotor.

1.3 The sound pressure fields obey the well-known wave equation <sup>20,21</sup>

$$\frac{\partial^2 p}{\partial x^2} + \frac{\partial^2 p}{\partial y^2} + \frac{\partial^2 p}{\partial g^2} - \frac{1}{c^2} \frac{\partial^2 p}{\partial t^2} = 0 \quad (1.1)$$

 $\chi$ , $\chi$ , $\chi$  being the cartesian coordinates andc is the free space velocity of sound.

If  $(\lambda, \theta, g)$  denote cylindrical polar coordinates  $x = \hbar \cos \theta$   $y = \hbar \sin \theta$  g = 3t = t

the wave equation (1.1) takes the form

$$\frac{\partial^2 p}{\partial n^2} + \frac{i}{n} \frac{\partial p}{\partial n} + \frac{i}{n^2} \frac{\partial^2 p}{\partial \theta^2} + \frac{\partial^2 p}{\partial \beta^2} - \frac{i}{\partial \beta^2} \frac{\partial^2 p}{\partial t^2} = 0 \quad (1.2)$$

By the separation of variables (so that the normal modes are obtained) the solution is of the form

$$p = p_n(n) p_0(0) p_3(3) p_t(t)$$

Substituting in equation (1.2) and dividing by  $\beta$ , gives

- 5

 $\frac{1}{p_n} \frac{d^2 p_n}{dn^2} + \frac{1}{n p_n} \frac{d p_n}{dn} + \frac{1}{n^2 p_0} \frac{d^2 p_0}{d\theta^2} + \frac{1}{p_3} \frac{d^2 p_3}{d3^2}$  $-\frac{1}{C^{2}k}\frac{d^{2}k}{dt^{2}}=0$ (1.3)

The 3 and t terms can then each be equated to constants, say,  $-\frac{k^2}{3}$  and  $-\frac{\omega^2}{c^2}$  respectively, and

so 
$$\frac{d^2 \dot{p}_3}{dg^2} = -k_3^2 \dot{p}_3$$
 and  $\frac{d^2 \dot{p}_4}{dt^2} = -\omega^2 \dot{p}_4$ 

Equation (1.3) then reduces to

$$\frac{1}{p_{r}} \frac{d^{2}p_{r}}{dn^{2}} + \frac{1}{p_{r}} \frac{dp_{r}}{dn} + \frac{1}{p_{r}^{2}p_{\theta}} \frac{d^{2}p_{\theta}}{d\theta^{2}} + \left(-\frac{k^{2}}{3} + \frac{\omega^{2}}{c^{2}}\right) = 0$$
If  $\frac{1}{p_{\theta}} \frac{d^{2}p_{\theta}}{d\theta^{2}} = -m^{2}$  (where *m* is a positive integer)
(1.4)

the above equation reduces to

$$\frac{d^{2} \dot{p}_{n}}{d n^{2}} + \frac{1}{n} \frac{d \dot{p}_{n}}{d n} + \left(-k_{3}^{2} + \frac{\omega^{2}}{c^{2}} - \frac{m^{2}}{n^{2}}\right) \dot{p}_{n} = 0 \quad (1.5)$$

The equations in  $\theta$ ,  $\beta$  and t are all of the same form and their solutions are all given by imaginary exponentials.

If 
$$k^2 = \frac{\omega^2}{c^2} - k_3^2$$
 (1.6)

the equation (1.5) for  $\not >_{i_{\nu}}$  takes the form of Bessel's equation and the solution is given by  $^{18,26}$ 

6 .

 $\dot{p}_n = A_m J_m (kn) + B_m Y_m (kn)$ 

where  $\mathcal{J}_m$  and  $\mathcal{Y}_m$  are Bessel's functions of the first and second kind respectively.  $A_m$ ,  $B_m$  are weight constants for an arbitrary pressure distribution.

But since  $\gamma_{\mathcal{M}} \to \infty$  as  $\mathcal{H} \to \infty$  and since the pressure function is finite everywhere within the duct including the duct axis,  $\gamma_{\mathcal{M}}$  is not included in the solution.

1.4 For a hard-walled duct, the normal pressure gradient at the duct walls is zero. The equation of the duct wall is given by  $\mathcal{H}=\mathcal{R}$  (a constant).

Hence

1.0.

$$\frac{\partial P}{\partial r} \Big|_{r=R} = 0$$

which is the same as

$$\frac{d}{dn} \left[ J_m(kn) \right]_{n=R} = 0$$

$$J_m'(kR) = 0.$$

For a given value of m and k, there is an infinity  $k_{m,\mu}$  ( $\mu = 0, i_{2}, \cdots$ ) of values of k which satisfies this equation, each  $k_{m,\mu}$  increasing in magnitude with  $\mu$ . For a given  $\mu$ , the pressure function has  $\mu$  pressure nodes in the radial direction.

So the pressure distribution function can be written as

 $p = J_m (k_m r) \frac{\sin m\theta}{\cos m\theta} e^{i(k_3 + \omega t)}$ 

(At any fixed position,  $\mathcal{U}$  represents the circular frequency of the pressure fluctuations).

In the above equation

 $k_{3}^{2} = \frac{\omega^{2}}{c^{2}} - k_{m\mu}^{2}$ 

1.5 Thus for any given value of  $k_{m\mu}$  only values of  $\omega$ which are greater than  $ck_{m\mu}$  give rise to real values of  $k_{j}$ . Hence the 'g' mode of the pressure function gives rise to a sinusoidal pressure distribution along the axis of the duct, causing the wave to propagate in this direction. Values of  $\omega < c k_{m\mu}$ , give imaginary values of  $k_{j}$ ; the pressure function becomes a negative exponential in g which results in an exponential attenuation of the pressure wave along the duct axis. This is known as the 'cut-off' phenomenon.

The values of  $k_{m\mu}$  give the cut-off frequencies for the various modes m of the pressure distribution. It is interesting to note that, as  $\mu$  increases in value,  $k_{m\mu}$  also increase.  $k_{mo}$  gives the lowest cut-off frequency for a particular mode 'm' of the pressure function. These values may be found in any tables relating to Bessel functions - see for example Olver 22.

The decay rates for frequencies below cut-off and their significance in a practical situation has been demonstrated by several workers. 3,25,26 DERIVATION OF THE WAVE EQUATION IN ELLIPTIC COORDINATE SYSTEM AND BOUNDARY CONDITIONS.

2.1 To study the behaviour of waves in an elliptic duct it becomes essential that a proper system of coordinates is chosen, the most convenient and relevant being the elliptic coordinate system.

If  $(x, y, \eta)$  are the cartesian coordinates and  $(\xi, \eta, \eta)$  the elliptic cylindrical coordinates, the following relation holds between them:  $x = h \cosh \xi \cosh \eta$   $y = h \sinh \xi \sinh \eta$  $\beta = \beta$ 

and when the wave equation (1.1) is considered, the time variable is kept unchanged.

In any  $n_j$ -constant plane, the  $\eta$ -constant curves are hyperbolae; the  $\xi$ -constant curves are ellipses with major axis 2h cosh  $\xi$  and minor axis 2h cuch  $\xi$ . The foci are at (+h, 0) and (-h, 0). (Fig. 2)

With this transformation the wave equation takes the form

 $\frac{2}{h^2(\cosh 2\xi - \cos 2\eta)} \left\{ \frac{\partial p}{\partial \xi^2} + \frac{\partial p}{\partial \eta^2} \right\} + \frac{\partial p}{\partial g^2} - \frac{1}{C^2} \frac{\partial^2 p}{\partial t^2} = 0$ (2.1)

To obtain a separable solution, as before, can be written as

 $p = p_{\xi}(\xi) p_{\eta}(\eta) p_{\zeta}(\zeta) p_{t}(t)$ 

2.

so that equation (2.1) reduces to, on substitution of the value of  $\not\!\!\!\!/$  and division by  $\not\!\!\!\!/$ ,

$$\frac{2}{h^{2}(\cosh 2\xi - \cos 2\eta)} \begin{cases} \frac{1}{p_{\xi}} \frac{d^{2}p_{\xi}}{d\xi^{2}} + \frac{1}{p_{\eta}} \frac{d^{2}p_{\eta}}{d\eta^{2}} \\ + \frac{1}{p_{\eta}} \frac{d^{2}p_{3}}{dy^{2}} - \frac{1}{c^{2}p_{t}} \frac{d^{2}p_{t}}{dt^{2}} = 0 \end{cases}$$

Equating  $r_{3}$  and t terms to constants  $-k_{3}^{2}$  and  $\frac{\omega^{2}}{c^{2}}$  respectively,

$$\frac{d^{2}h_{3}}{dg^{2}} = -k_{3}^{2}h_{3}^{2} \quad \text{and} \quad \frac{d^{2}h_{t}}{dt^{2}} = -\frac{\omega^{2}}{c^{2}}h_{t}^{2}$$
and
$$\frac{1}{p_{s}}\frac{d^{2}h_{s}}{ds^{2}} + \frac{1}{p_{\eta}}\frac{d^{2}h_{\eta}}{d\eta^{2}} + \left(\frac{\omega^{2}}{c^{2}}-k_{3}^{2}\right)\frac{h^{2}}{\omega}\left(\omega sh^{2}s - \cos 2\eta\right) = 0$$
Let
$$\frac{1}{p_{s}}\frac{d^{2}h_{s}}{ds^{2}} + \frac{1}{p_{\eta}}\frac{d^{2}h_{\eta}}{d\eta^{2}} + \left(\frac{\omega^{2}}{c^{2}}-k_{3}^{2}\right)\frac{h^{2}}{\omega}\left(\cos h^{2}s - \cos 2\eta\right) = 0$$
and
$$\frac{1}{p_{s}}\frac{d^{2}h_{s}}{ds^{2}} + \left(\frac{\omega^{2}}{c^{2}}-k_{3}^{2}\right)\frac{h^{2}}{\omega}\left(\cos h^{2}s - \cos 2\eta\right) = 0$$
where 'a' is a separation constant, known as the char-

acteristic number.

The above equations can now be written out separately as follows:

$$\frac{d^{2} p_{\eta}}{d \eta^{2}} + \left[a - \frac{h^{2}}{2} \left(\frac{\omega^{2}}{c^{2}} - k^{2}\right) \cos 2\eta\right] p_{\eta} = 0 \qquad (2.2)$$

$$\frac{d^{2} p_{\xi}}{d\xi^{2}} - \left[a - \frac{\hbar^{2}}{2} \left(\frac{\omega^{2}}{e^{2}} - k_{z}^{2}\right) \cosh 2\xi\right] p_{\xi} = 0 \quad (2.3)$$

If 
$$q = \frac{\hbar^2}{4} \left( \frac{\omega^2}{e^2} - \frac{\hbar^2}{3} \right)$$
 (2.4)

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the equations (2.2) and (2.3) reduce to the form

$$\frac{d^2 p_{\eta}}{d\eta^2} + (a - 2q \cos 2\eta) p_{\eta} = 0$$
 (2.5)

$$\frac{d^{2} \dot{p}_{\xi}}{d\xi^{2}} - (a - 2q \cos 2\xi) \dot{p}_{\xi} = 0$$
(2.6)

which are the canonical forms of Mathieu's equation and 2,19 the modified Mathieu equation.

It can be seen here that if  $\eta = 2\xi$  equation (2.5) transforms to equation (2.6) and conversely if  $\xi = 2\eta$ , equation (2.6) transforms to equation (2.5).

. The separation constant ! a here is such that as  $q \rightarrow 0$ ,  $a \rightarrow m^2$ , where m is a positive integer. 2.2 The solutions of equation (2.5) are the even and odd Mathieu functions,  $\mathcal{C}\ell_m$  and  $\mathcal{S}\ell_m$  of order  $\mathcal{M}$ , when  $a \Rightarrow m^{L}$  as  $q \Rightarrow 0$ . These functions  $CL_{m}$ ,  $SL_{m}$  are functions of both  $\eta$  and q and are such that as q o o ,  $\mathcal{Cl}_m \rightarrow \omega sm\eta$  and  $\mathcal{Sl}_m \rightarrow sinm\eta$ . The even 'cosine-elliptic' functions correspond to the cosine functions in the circular case and the odd 'sine-elliptic' functions correspond to the sine functions. In a circular duct the periodic . sinusoidal waves of order  ${\mathcal m}$  around its periphery can be of either sinusoidal or cosinusoidal form depending on their values at any particular vectorial axis. In an elliptic duct, these wave forms are dependent on the axis of symmetry. For the same value of a and q ,  $ce_m$  and  $se_m$  form a fundamental system of solution for the Mathieu equation The solution, therefore, can be written as (2.5).

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 $\dot{p}_{\eta} = A_{c} c e_{m} (\eta, q) + A_{s} s e_{m} (\eta, q)$ 

which gives us the pressure distribution in the circumferential mode. The  $C\ell_m$  and  $s\ell_m$  are periodic with period  $\pi$  or  $2\pi$  depending on m being even or odd.

The solutions of the modified Mathieu equation (2.6) are the modified Mathieu functions, also called radial Mathieu Functions as they represent the radial pressure distribution in the duct. It can be shown that as  $g \rightarrow o$ , the equation (2.6) reduces to the Bessel's equation (1.5). The radial Mathieu functions  $Ce_m$  and  $Se_m$  of the first kind are the even 'cosh-elliptic' and odd 'sinh-elliptic' functions respectively and they are periodic with period  $\pi i$  or  $2\pi i$ . As a matter of fact

> $Ce_{m}(\xi,q) = ce_{m}(i\eta,q)$  $Se_{m}(\xi,q) = -i \beta e_{m}(i\eta,q)$

There exist radial Mathieu functions of the second, third and fourth kind, but these functions do not satisfy (as shall be shown) the necessary boundary conditions and hence are not included in the pressure distribution function.

2.3 The boundary conditions to be satisfied by the pressure function p in a reference plane g=0 are as follows:

(a) Since  $\not\!\!\!\!/$  is single-valued, it is periodic in  $\eta$  with a maximum period of 277 .

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(b)  $p(\xi, \gamma)$  is continuous in the duct and in particular, it is continuous across the interfocal line,

i.e. 
$$p(0, \gamma) = p(0, -\gamma)$$

(c) On crossing the interfocal line, there is continuity of the pressure gradient, so that

$$\frac{\partial p}{\partial \xi}(0,\eta) = -\frac{\partial p}{\partial \xi}(0,-\eta)$$

and (d) the component of the pressure gradient normal to the wall of the duct (it being hard walled) is zero at the walls. On this boundary  $\xi = \xi_0$ . Hence

The functions  $\mathcal{C}\ell_m$  and  $\mathcal{S}\ell_m$  are periodic in  $\eta'$ (and with period  $\pi$  or  $\mathfrak{Z}\pi$ , so long as m is a positive integer). Hence they satisfy condition (a).

If  $Ce_m(\xi, q)$  is a solution of equation (2.6),  $Ce_m(0, q)$  is a constant.  $Ce_m(\gamma) = Ce_m(-\gamma)$ , as  $Ce_m$  are even functions.

so  $Ce_m(\xi)Ce_m(\eta)$  satisfies condition (b).

Since  $Se_m(0, \gamma)$ ,  $Se_m(0) Se_m(\eta) = Se_m(0) Se_m(\eta)$ . Hence  $Se_m(\xi) Se_m(\eta)$  satisfies condition (b) Consider now  $Ce_m(\xi) Se_m(\eta)$ . Since  $Se_m(\eta)$   $= -Se_m(-\eta)$ ,  $Se_m$  being odd,  $Ce_m(0) Se_m(\eta) \neq (e_m(0) \times Se_m(-\eta))$ . So  $Ce_m(\xi) Se_m(\eta)$  does not satisfy condition (b). On the same lines it can be proved that  $Se_m(\xi) Ce_m(\eta)$ does not satisfy condition (b).

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It can be proved that the combinations  $Ce_m(\xi) \times CC_m(\eta)$  and  $Se_m(\xi) \times e_m(\eta)$  satisfy the conditions (a), (b) and (c) and are in fact the only possible combinations of Mathieu and modified Mathieu functions satisfying the boundary conditions (a), (b) and (c). The solutions of the second, third and fourth kinds fail to satisfy the condition (c) and hence are not included in the pressure function.

Hence the only acceptable solutions of the wave equation for the pressure field are given by

 $p = \frac{C_m C_{e_m}(\xi,q) c_m(\eta,q)}{S_m S_{e_m}(\xi,q) s_m(\eta,q)} \left\{ \begin{array}{c} 2k \\ e \\ 3 \\ \end{array} \right\} \cos(\omega t + \alpha)$ 

which satisfy the conditions (a), (b) and (c).

Now the condition (d) requires that when  $\xi = \hat{\xi}_c$ (i.e. on the boundary of the elliptic duct)  $\frac{\partial \dot{P}}{\partial \dot{\xi}} = 0$ which is

$$\frac{d}{d\xi} \left( e_m(\xi, q) \right|_{\xi=\xi_0} = 0 \text{ or } \left| \frac{d}{d\xi} Se_m(\xi, q) \right|_{\xi=\xi_0} = 0 \quad (2.7, \ 2.8)$$

corresponding to each value of m, these equations, for a given value  $\xi_c$  of  $\xi$ , give an infinity of positive values of q, which satisfy the above equations. The first equation gives a set of values  $q_{m_{\mu}}$  ( $\mu = 0, 1, 2, \cdots$ ) which satisfy it. The second equation gives a set of values  $\bar{q}_{m_{\mu}}$  (say) which satisfy it. These are known as the parametric zeros of the functions. For each value of  $\mu c$ , both

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 $q_{m\mu}$  and  $q_{m\mu}$  give the nodal (zero pressure) ellipses in the reference plane. Since  $Ce_m$  and  $Se_m$  from a fundamental system of solution for equation (2.6), it is to be noted that none of the  $q_{m\mu}$  and  $\bar{q}_{m\mu}$  are the same for the same value of m and  $\mu$  and a given characteristic value  $\alpha$ . PREVIOUS WORK ON ELLIPTIC WAVE PROPAGATION.

3.1 From equation (2.4),

 $q = \frac{h}{4} \left( \frac{\omega^2}{c^2} - k_3^2 \right)$ 

the important relationship

$$k_{3} = \left(\frac{\omega^{2}}{c^{2}} - \frac{49}{h^{2}}\right)^{1/2}$$
(3.1)

is obtained.  $4q/h^2$  here corresponds to the k' mentioned in the circular case. As  $q \rightarrow 0$ , equation (2.6) reduces to equation (1.4) as mentioned earlier. Indeed, this corresponds to  $h \rightarrow 0$  with the ellipses becoming circles.

11

If  $\mathcal{W}_{\mathcal{C}}$  is such that  $\mathcal{W}_{\mathcal{C}} < 2\sqrt{g_{\mathcal{M}\mathcal{U}}}/h$ , where  $g_{\mathcal{M}\mathcal{U}}$  is a parametric zero obtained from equation (2.7), the value of  $k_{\mathcal{A}}$  from (3.1) becomes imaginary; the pressure function becomes a negative exponential resulting in an exponential decay of waves along the axial direction of the duct.

If  $\omega/c \ge 2\sqrt{\frac{2}{m\mu}}/h$ , real values of  $k_{2}$  are obtained and this mode is propagated along the duct without attenuation.

For a particular m,  $q_{mo}$  gives the parametric zero such that  $\omega/c \ge 2/q_{mo}/h$ , which gives the cut-off frequency for the particular mode m. The higher order radial modes associated with  $q_{m\mu}$  are of less significance and will not be considered further.

Though the theory of propagation and attenuation

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З.

of waves with elliptic boundary conditions have been considered by many authors  $^{6,7,10,13}$  , actual determination of the 'non-dimensionalised' cut-off frequencies, though only for the lowest order modes, 0 and 1, have been found only by Chu and by Daymond. In what follows work done by Jeffreys, Chu and Daymond is described as a basis for further development.

3.2 <sup>13</sup> In an elliptical lake of uniform depth d, let  $\Im$  represent the vertical displacement from its equilibrium position of the water surface. Let the lake be stationary in space and let  $\Im$  be an imaginary exponential function of the time variable t. If  $\Im$  is so small that its second and higher powers could be neglected, it can be proved that  $\Im$  satisfies the reduced wave equation

$$\frac{\partial^2 g}{\partial x^2} + \frac{\partial^2 g}{\partial y^2} + \frac{\omega^2}{c^2} g = 0$$
 (3.2)

 $C^2 = g d$ , C being the free wave velocity in an unrestricted expanse of water of uniform depth d and g being the acceleration due to gravity. x, y coordinates are chosen with axes along the major and minor axes respectively of the elliptic boundary, origin being at its centre (Fig. 2).

Transforming to elliptic coordinates (see chapter II) the equation (3.2) reduces to

$$\frac{\partial^2 S}{\partial \xi^2} + \frac{\partial^2 S}{\partial \eta^2} + 2k^2 (\cosh 2\xi - \cos 2\eta) S = 0, \ 2k = \frac{\omega h}{c} \quad (3.3)$$

The form of  $\S$  is then given by

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 $\mathcal{G}(\xi,\eta,t) = \frac{C_m (\varepsilon_m(\xi,q)) e e_m(\eta,\eta)}{S_m S e_m(\xi,q) s e_m(\eta,q)} \left[ \frac{e_m(\omega_m t + \varepsilon_m)}{e_m(\eta,q)} \right]$ (3.4)

 $\omega_m$  is the angular frequency of vibration of the mth mode and  $\varepsilon_m$  is the relative phase angle.

The velocity normal to an ellemental arcual length ds of an ellipse, that is, in the direction dn, is given by

$$u_n = \frac{ig}{\omega} \frac{\partial S}{\partial n} = \frac{ig}{\omega l_1} \frac{\partial S}{\partial \xi} \quad \text{where } dn = l_1 d\xi, l_1 = \frac{h}{\sqrt{2}} (\cosh 2\xi - \cos 2\eta)$$

On the boundary  $\xi = \xi_o$ , the normal velocity is zero and hence

 $\begin{bmatrix} \frac{\partial S}{\partial \xi} \end{bmatrix} = 0$ which reduces to  $Ce'_{m}(\xi_{0}, \gamma) = 0$  and  $Se'_{m}(\xi_{0}, \gamma) = 0$ from equation (3.4).

The values  $q_{\mu\mu}$  and  $q_{\mu\mu}$  satisfying the above respective equations have now to be found.

Consider the lowest modes  $m = 1, \mu = 1$  when  $\mathcal{S}$  is proportional to  $Ce_{\mu}(\xi, g_{\mu}) Ce_{\mu}(\eta, g_{\mu})$ . Let us consider an ellipse of given eccentricity.

Suppose the boundary of the elliptic lake has eccentricity  $\ell = 0.8$ . Then  $\cosh \xi_0 = 1/\ell = 1.25$ ,  $ex/r(\xi_0)=2$ ,  $ex/r(\xi_0)=0.5$  and  $\xi_0 = .693/$ From the expansions of  $Ce_1(\xi_0, 9)$  (see Chapter IV) • Though the function is normalised differently.

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Therefore

$$\begin{aligned} \text{Ce}_{i}(\xi_{0},q) &\simeq -\alpha^{3}(\frac{1}{18}\cosh 7\xi_{0} - \frac{4}{9}\cosh 5\xi_{0} + \frac{1}{3}\cosh 5\xi_{0}) &= \alpha^{2}(\frac{1}{3}\cosh 5\xi_{0} - \cosh 3\xi_{0}) \\ &= \alpha\cosh 3\xi_{0} + \alpha^{2}(\frac{1}{3}\cosh 5\xi_{0} - \cosh 3\xi_{0}) \end{aligned}$$

where  $\alpha = \frac{1}{8} \gamma$ 

Therefore  

$$Ce_{1}^{\prime}(\underline{5}_{0},\underline{9}) \simeq -\alpha^{3}(\frac{7}{18}\sinh 7\underline{5}_{0} - \frac{20}{9}\sinh 5\underline{5}_{0} + \frac{1}{9}\sinh 3\underline{5}_{0}) - \alpha^{2}(\frac{5}{3}\sinh 5\underline{5}_{0} - 3\sinh 3\underline{5}_{0}) - 3\alpha\sinh 3\underline{5}_{0} + \sinh 5\underline{5}_{0} - 3\sinh 3\underline{5}_{0})$$

Since  $Ce_i(\xi_0, \varphi) = 0$ , substituting in terms of  $exp(\xi_0)$  and  $exp(-\xi_0)$  for sink  $\xi_0$ , an equation in  $\alpha$  is obtained. The smallest positive root of this equation gives  $\alpha \simeq 0.07$ , i.e.  $q \simeq 0.56$ , and since  $4q = \omega^2 h^2/c^2$  and h = ae

$$\omega_1^2 = \frac{4q_1}{a^2e^2}$$

Therefore  $\omega_{\mu} \simeq 1.87 c/\alpha$ , which gives the pulsatance of the water waves mainly parallel to the direction of the major axis. From Bessel function tables, the lowest root for a circular lake is given by  $\omega_{\mu} \alpha / c \simeq 1.84$  or  $\omega_{\mu} = 1.84 c/\alpha$ 

Thus we see that the pulsatance of this mode for a lake of eccentricity  $e = O \cdot S$  is only slightly different from the same for a circular lake.

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Let  $\mathcal{S} \propto \mathcal{S}e_i(\xi, \tilde{q}_{ii}) \mathcal{S}e_i(\gamma, \tilde{q}_{ii})$ , in which case the oscillations are across the major axis.

$$Se_{1}(\overline{5}_{0}, \overline{9}) \simeq \overline{a}^{3}(\frac{7}{18}\cosh 7\overline{5}_{0} + \frac{20}{9}\cosh 5\overline{5}_{0} + \cos 5\overline{5}_{0} + \cos 5\overline{5}_{0}) + \overline{a}^{2}(\frac{5}{3}\cosh 5\overline{5}_{0} + 3\cosh 3\overline{5}_{0}) - 3\overline{a}(\cosh 3\overline{5}_{0}) + \cosh \overline{5}_{0}$$

where  $\vec{\alpha} = \frac{1}{8} \ \vec{q}$ 

Considering an elliptic boundary of eccentricity e = 0.9the equation  $Se'_i(\xi_0, \tilde{q}) = 0$  reduces to a cubic in  $\overline{\alpha}$ , whose smallest positive root  $\overline{\alpha} \simeq .175$ , so that  $q_{11} \simeq 1.4$ . Hence, since  $\overline{\omega}_i^2 = \frac{4}{9} \frac{\overline{q}_{11}}{\alpha^2 e^2}$ ,  $\overline{\omega}_i = \frac{2.96}{\alpha} \frac{c}{\alpha} = 1.78 \frac{c}{b}$ . Comparing  $\overline{\omega}_i$ , and  $\omega_i$ ,

$$\frac{\omega_1}{\omega_1} = \frac{2.96}{1.87} = 1.58$$

which shows that the pulsatance across the major axis is about 40 per cent more than that parallel to the major axis.

When the eccentricity of the lake boundary tends to unity, the lake is a long narrow ellipse. Now, since  $\cosh \xi_0 = 1/e$ ,  $\xi_0$  has values very near zero and  $= \sinh \xi_0 \simeq \xi_0$ .

If  $\mathcal{G} \simeq Ce_{1}(\xi, q_{11}) Ce_{1}(\eta, q_{11})$ , the equation  $Ce_{1}'(\xi_{0}, q_{1}) = 0$  reduces to  $5 \cdot 39 \alpha^{3} - 0 \cdot 667 \alpha^{2} - 9 \alpha + 1 = 0$ where  $\alpha = 1/8 q$ .

The smallest positive root of this equation is

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 $\alpha \simeq 0.111$ , so  $q_{11} = 0.888$ .

Hence as  $\ell \rightarrow i$ , we get  $\omega_i = 1.886 C/\alpha$  which shows that the effect of elongating an ellipse on the frequency for the lowest mode is quite negligible. 3.3 In the paper by Chu<sup>6</sup>, electro-magnetic waves in a perfectly conducting elliptic metal pipe have been discussed. The values of the critical cut-off wavelengths have been calculated for the electrical field E waves and the magnetic field H-waves.

For an electro-magnetic wave, the Maxwell's equations have to be solved, assuming a boundary condition that the tangential component of the electrical field in air must vanish. It is further assumed that the metal pipe has perfect conductivity. With the help of these equations, the wave equations for  $E_3$  and  $H_3$  components of the electric and magnetic field respectively are obtained. As the wave is propagating in an elliptic guide, both  $E_3$  and  $H_3$  satisfy the Mathieu equation (2.5) and the modified Mathieu equation (2.6).

Hence their forms are given by

$$\begin{bmatrix} E \\ 3 \\ 4 \end{bmatrix} = \begin{pmatrix} c_m (e_m (\xi, q)) e_m (\eta, q) \\ = \\ S_m Se_m (\xi, q) se_m (\eta, q) \\ \end{bmatrix} e^{i(\omega t - k_3)}$$
(3.5)
$$\begin{bmatrix} H \\ 3 \end{bmatrix} = \begin{pmatrix} c_m (e_m (\xi, q)) se_m (\eta, q) \\ g_{1} \\ g_{2} \\ g_{3} \\$$

m th order of the functions being considered.

If the longitudinal component of the electric field is zero then  $\tilde{E}_3 = 0$  and the propagating wave is called

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So the components of the field in this case are given by  $H_{3} = A$  as in equation (3.6)  $H_{5} = \frac{\beta}{\mu\omega} E_{3} (\mu \text{ being the permeability of the medium})$  $H_{\eta} = \frac{1}{\mu \omega} E_{\xi}$  $E_3 = 0$  $E_{\xi} = \frac{\mu \omega}{k_{p}^{2} h (\cosh 2\xi - \cos 2\eta)^{1/2}} \begin{cases} C_{m} C_{m} (\xi, q) c_{m} (\eta, q) \\ S_{m} S_{m} (\xi, q) s_{m} (\eta, q) \end{cases}$ 2(wt - k33)  $\begin{array}{c} (k,h = 2 fq) \\ E_{\eta} = \frac{2 fq}{k_{c}^{2} h \left( \cosh 2\xi - \cos 2\eta \right)^{2}} \left\{ S_{m} S_{m} \left( \xi,q \right) se_{m} \left( \eta,q \right) \right\} \\ \end{array}$ ; (wt-k,3)

Since the tangential component of the electric field En must vanish on the boundary  $\xi = \xi_0$ ,  $Ce'_m(\xi_0,q)=0$ 

$$Se'_m(z_0,q)=0$$

an H-wave.

These equations determine values 9mo ' 9mo of  $q_{\gamma}$  which give the critical cut-off frequencies of the It is particularly interesting to note m th order wave. that the sound waves in a duct behave very similarly to these H-waves.

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If the longitudinal component of the magnetic field vanishes while both the transverse and the longitudinal components of the electric field exist, this wave is called an E-wave. In this case  $H_3 = 0$ , and  $E_3$  is given by equation (3.5). These waves satisfy the boundary con ditions  $\hat{C}e_m(\xi_0, q) = 0$  and  $Se_m(\xi_0, q) = 0$ .

The wavelengths  $\lambda_{mo}$  for cut-off condition are given by the relation  $k_{mo} = 2\pi / \lambda_{mo}$ , where  $k_{mo} = 2x$  $\sqrt{q}_{mo} / \hbar$  or  $2\sqrt{q}_{mo} / \hbar$  depending on whether even or odd function is considered.

Fig. 3 represents the ratios  $\lambda_o/\beta$  as functions of the eccentricity e of the ellipses;  $\lambda_o$  are cut-off wavelengths for orders 0 and 1,  $\beta$  is the periphery of the pipe given by  $2\pi$ 

$$p = h \cosh \overline{z}_0 \int_0^\infty \left\{ 1 - (\cos \eta / \cosh \overline{z}_0) \right\}^n d\eta$$

3.4 The above gave an idea of the behaviour of the waves when a circular pipe was deformed into an elliptic one. The values of the cut-off frequencies were found not independent of the periphery of the ellipse. In what follows 7, the ellipse is so deformed that the area of the cross-section remains constant, while the eccentricity changes. Let this constant area be 77, which is also the area of a circle of unit radius.

An important property <sup>14</sup> connected with the reduced wave equation

 $\frac{\partial^2 p}{\partial x^2} + \frac{\partial^2 p}{\partial y^2} + k^2 p = 0$ 

for a region  ${\mathcal R}$  is given below. The cut-off frequencies

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(3.7)

for ellipses of different sizes but same eccentricity can be scaled from this property.

If the equation (3.7) is valid under the boundary condition  $\partial p / \exists n = 0$ , on the boundary of R, then there is an infinity of values of k,  $k_{j}$   $(i=0,1,2,\cdots)$  such that

 $0 = k_0 < k_1 \le k_2 \le \cdots$ 

which satisfy the equation (3.7). These  $k_j$  are known as the eigen values of equation (3.7).

If A is the area of the region R,  $\overline{A}$  is the area of another region  $\overline{R}$  which is similar to R and if  $\overline{k_j}$  are the values of k satisfying equation (3.7) for the region  $\overline{R}$ , then

$$\frac{k_i}{\frac{1}{R}} = \frac{A}{\overline{A}}$$

Hence, the eigen values  $k_i$  corresponding to any other elliptical boundary with the same eccentricity  $\mathbb{C}$ can be found with the help of equation (3.8), once the eigen values corresponding to an ellipse, with area  $\mathcal{T}$ and eccentricity  $\mathcal{C}$ , have been found.

(3.8)

Consider an ellipse of eccentricity *C* and area 77. The reduced wave equation (3.7) when transformed to elliptic coordinates gives

$$\frac{d^{2}p_{\eta}}{d\eta^{2}} + (a - 2q \cos 2\eta)p_{\eta} = 0$$
  
$$\frac{d^{2}p_{\pi}}{d^{2}p_{\pi}} - (a - 2q \cosh 2\pi)p_{\pi} = 0$$
  
$$\frac{d^{2}p_{\pi}}{d^{2}\pi^{2}} - (a - 2q \cosh 2\pi)p_{\pi} = 0$$

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where

$$p = p_{\xi}(\xi) p_{\eta}(\eta) \text{ and } k^{2} = 4\eta/h^{2}$$

Since the area of the ellipse is  $\pi$ ,  $h^2 = e^2 (i - e^2)^{-1/2}$ Let  $s = 4q = k^2 h^2 = k^2 e^2 (i - e^2)^{-1/2}$  (3.9)

If 
$$\xi = \xi_0$$
 on the boundary, then  $\cosh \xi_0 = 1/e$   
If  $u = \sqrt{q} \exp(\xi_0)$  and  $v = \sqrt{q} \exp(-\xi_0)$   
 $\omega_0 = u + v = 2 \sqrt{q} \cosh \xi_0 = \sqrt{s} \cosh \xi_0$ 

Hence

$$\omega_0^2 = s \cosh^2 \xi_0 = s/e^2 \qquad (3.10)$$

(from (3.9))

and since  $s = k^2 e^2 (1 - e^2)^{-1/2}$ 

$$\sigma_0^2 = k^2 (1 - e^2)^{-1/2}$$
(3.11)

The boundary conditions reduce to /

 $(\epsilon_m'(\xi_o, \gamma) = 0$  and  $S_{2m+1}'(\xi_o, \gamma) = 0, m = 0, 1, 2, \cdots$ Determining the parametric zeros by direct evaluation is not possible in practice. The method used to obtain the values of  $k(=2\sqrt{\gamma}/4\nu)$  is given in detail in Chapter V. In Daymond's work <sup>7</sup> the principal frequencies have been found. It shall be discussed how the cut-off frequencies have been found for higher orders. The values calculated for the lowest order agree with those found in Daymond.

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MATHIEU FUNCTIONS AND EXPANSIONS IN SERIES.

4.1  

$$\frac{d^{2}g}{d\eta^{2}} + (a - 2\eta \cos 2\eta)g = 0 \qquad (4.1)$$

$$\frac{d^{2}g}{d\eta^{2}} = 0$$

$$\frac{d_3}{d\xi^2} - (a - 2q \cosh 2\xi) = 0$$
(4.2)

are Mathieu equation and modified Mathieu equation re-

The solutions of equation (4.1) can be classified into four categories as follows:

(i)  $CC_{2n}(\gamma, \gamma)$ , even functions with period  $\overline{\tau}$ (ii)  $CC_{2n+i}(\gamma, \gamma)$ , even functions with period  $2\overline{\tau}$ (iii)  $SC_{2n+2}(\gamma, \gamma)$ , odd functions with period  $\overline{\tau}$ (iv)  $SC_{2n+1}(\gamma, \gamma)$ , odd functions with period  $2\overline{\tau}$ 

(Only periodic functions occur in the pressure function and hence they are considered here).

Functions  $le_{\chi n}$ ,  $le_{\chi n+1}$ ,  $le_{\chi n+2}$ ,  $le_{\chi n+1}$ ,  $le_{\chi n+2}$ ,  $le_{\chi n+1}$ respectively correspond to the above functions and are solutions of equation (4.2). These functions have imaginary periods.

The functions  $\mathcal{Ce}_m$  and  $\mathcal{Ae}_m$  can be expanded in Fourier series

 $ce_{2\eta}(\eta,q) = \underset{h=0}{\overset{\circ}{\underset{n=0}{\overset{(n)}{\underset{n=0}{\overset{(n)}{\atop}}}}} A cos 2\eta h} (\alpha_{2\eta}) (4.3) (i)$ 

4.

$$Ce_{2n+i}(\eta, q) = \sum_{h=0}^{\infty} A_{h+i} \cos(2h+i)\eta \qquad (a_{2n+i})$$
(4.3) (ii)

$$Se_{2n+2}(\eta, q) = \sum_{n=0}^{\infty} B_{2n+2} Sin(2n+2)\eta \qquad (b_{2n+2}) \\ (4.3) (iii)$$

$$Sl_{2n+1}(\eta, q) = \sum_{\lambda=0}^{\infty} \beta_{\lambda+1}^{(2n+1)} \sin(2\lambda+1)\eta \qquad (k_{2n+1})$$
  
 $\lambda=0 \qquad \lambda+1 \qquad \text{sin}(2\lambda+1)\eta \qquad (k_{2n+1}) \qquad (iv)$ 

where the coefficients A,B are functions of  $q_{\rm p}$ , and so are the characteristic numbers a, b. The functions in (4.3) are normalised such that

$$\frac{1}{\pi} \int_{0}^{2\pi} ce_{m}^{2}(\eta, q) d\eta = \frac{1}{\pi} \int_{0}^{2\pi} se_{m}^{2}(\eta, q) d\eta = 1$$
(4.4)

for all  $\alpha$  . From (4.3) and the orthogonal property of the circular functions, (4.4) gives

$$2\left[A_{0}^{(2n)}\right]^{2} + \sum_{h=1}^{\infty} \left[A_{2h}^{(2n)}\right]^{2} = I = \sum_{h=0}^{\infty} \left[A_{2h+1}^{(2n+1)}\right]^{2} = \sum_{h=0}^{\infty} \left[B_{2h+2}^{(2n+2)}\right]^{2} = \sum_{h=0}^{\infty} \left[B_{2h+1}^{(2n+1)}\right]^{2}$$
(4.5)

The constant term in the expansion of  $CC_0(7, 9)$  is  $2^{-1/2}$ , for if q=0, the equation (4.4) would become  $\frac{1}{\pi} \int_{0}^{2\pi} d^2 q = 2$ 

If  $\xi = i \eta$ , then the solutions of (4.2) can be written as

$$Ce_{2n}(\xi, q) = ce_{2n}(i\eta, q) = \stackrel{\circ}{\underset{n=0}{\leq}} A_{2n}^{(2n)} cosh2n\xi \quad (a_{2n})^{(1)}$$

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 $Ce_{2n+1}(\xi, q) = Ce_{2n+1}(iq, q) = \sum_{h=0}^{\infty} A_{2h+1}(\cosh(RA+1)\xi) (q)_{2n+1}(ii)$  $Se_{in12}(\xi,q) = se_{2n+2}(i\eta,q) = \underset{\lambda=0}{\overset{(in1,q)}{=}} \underset{\lambda=0}{$ (4.6)  $S_{e_{2n+1}}(\xi,q) = \lambda e_{2n+1}(i\eta,q) = \frac{\beta}{2} B_{2n+1}(i\eta,q) = \frac{\beta}{$ The A, B, a and b being the same as in (4.3) for the same At this point, another method of normalisation of 4.2 22 (This has the solutions of equation (4.1) is given. been used by most American authors). The solutions in this case are  $Se_{r}$ ,  $S_{\mathcal{O}_{r}}$  (not to be confused with  $Se_{r}$ , solutions of (4.2)) normalised by the conditions  $Se_{5}(3,0)=0$ and  $\frac{d}{dn} \left[ So_n(s, \eta) \right] = 1$  $\mathcal{S} = \mathcal{A} \mathcal{V}$  ,  $\mathcal{P}$  is the same as in equation (4.1). where The expansions of  $Se_n$  and  $So_n$  are given respectively by Se  $(s,\eta) = \mathcal{E} De^{(2n+\beta)} \cos(2n+\beta)\eta$  $2n+\beta$ , n=0  $2n+\beta$ (be) Zn+p and  $S_{0} (\Delta, \eta) = \sum_{\lambda=0}^{\infty} D_{0} \sum_{\lambda+\beta}^{(2n+\beta)} \sin((2\lambda+\beta)\eta)$ (10) 2n+þ

where  $\beta = 0$  or 1 according as the function under consideration is of period  $\pi$  or  $2\pi$  and  $b = a_1 + 2q$ ,  $b = b_1 + 2q$ 

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 $a_h$ ,  $b_h$  being the even and odd characteristic numbers in (4.3) respectively.

The normalisation condition gives

$$\stackrel{\infty}{\geq} De = 1, \stackrel{\infty}{\geq} (2h+p)Do = 1.$$
  
 $h=0$   $2h+p$   $h=0$   $h=0$ 

The relationship between the coefficients here and the coefficients in (4.3) is given by

$$De_{2n+p}^{(m)} = A_{2n+p}^{(m)} | A$$

and

$$Do_{2h+p}^{(m)} = B_{2h+p}^{(m)} / B$$

where

$$\frac{1}{A^{2}} = \left[ 2 \left( De_{0}^{(m)} \right)^{2} + \left( De_{3}^{(m)} \right)^{2} + \cdots \right] \partial \left[ \left( De_{1}^{(m)} \right)^{2} + \left( De_{3}^{(m)} \right)^{2} + \cdots \right]$$

2

and  

$$\frac{1}{B^2} = \underbrace{\geq}_{h=0}^{\infty} \left( \underbrace{\mathcal{D}}_{ah+b}^{(m)} \right)^{2}$$

4.3 On substituting the value of  $\mathcal{CE}_{2n}$  from (4.3) in the Mathieu equation (4.1) and equating to zero the coefficients of  $\mathcal{COS2h\eta}$ , the following recurrence relation is obtained<sup>19</sup>

$$a A_0 - q A_2 = 0$$
  
-2q A\_0 + (a-4)A\_2 - q A\_4 = 0  
-q A\_{2n-2} + (a-4n^2)A\_{2n} - q A\_{2n+2} = 0  
(4.7)

Let  $A_{2n}$  decrease to zero as h becomes very large

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compared to the order of the function.

If  $v_{2n} = A_{2n+2} / A_{2n}$ , the third of the equations (4.7) gives

$$-\frac{q}{v_{2h-2}} + (a - 4n^2) - q v_{2h} = 0 \quad \left(\frac{A_5}{A_{2h}} - \frac{A_{2h-2}}{A_{2h}} - \frac{1}{v_{2h-2}}\right)$$

Therefore

$$(a - 4n^{2})v_{2n-2} - 9v_{2n}v_{2n-2} - 9 = 0$$

Hence

$$v_{2n} + \frac{1}{v_{2n-2}} = \frac{a-4n^2}{9}$$

If (n+1) is written for n,

$$v_{2\lambda+2} + \frac{1}{v_{2\lambda}} = \frac{a - 4(\lambda+1)^2}{9}$$

So, when  $\gamma \rightarrow \omega$ ,  $v + \frac{1}{2} \rightarrow -\infty$  $2\lambda + 2 \quad v$  $2\lambda$ 

Thus  $\frac{v}{2h}$  cannot have a unique finite limit other than zero.

Hence

As the coefficients  $A_{2h}$  are so found that  $A_{2h} \rightarrow Oash \rightarrow A_{2h}$  $v_{2h}$  too must approach zero. Hence one of the solutions of the third of the equations (4.7) tends to zero when  $x \rightarrow \infty$  while the other tends to  $\infty$ . But we cannot have

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a solution tending to  $\aleph$ . Hence when h is very large  $v_{2h+2} v_{2h} \ll 1$  and  $a \ll 4(h+1)^{\perp}$ . With a, q finite

$$|v_{2r}| \sim \frac{q}{4(r+l)^2} \rightarrow 0 \text{ as } r \rightarrow \infty$$

So for a real  $\eta$  as  $|\cos 2\pi\eta| \le 1$ ,  $Ce_{2\pi}(\eta, q)$ is absolutely convergent. Since for any  $\eta$  in a given closed interval, it is possible to find an M independent of  $\eta$  such that  $\left|\frac{A_{2\lambda}\cos 2\lambda \eta}{A_{2\lambda-2}\cos(2\lambda-2)\eta}\right| \sim \frac{q}{4(\lambda+1)^2} < M$ 

the series is uniformly convergent. Thus the expansion (4.3) for  $\ell\ell_{2\eta}$  represents a continuous function for all real  $\eta$  .

When  $\eta$  is not real (i.e. when  $\eta = 2\xi$  )

$\left \frac{u_{n+1}}{u_n}\right  =$	$\left \frac{A_{2(n+1)}}{A_{2n}}\right $	COS2(1+1)7 COS217	=  v <sub>2</sub> /2	COSK 2(カ+1)支 	
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$$\simeq \frac{q}{4(\lambda+1)^2} e \longrightarrow 0 \text{ as } \lambda \to \infty$$

so long as  $|\xi|$  remains finite, i.e.  $\xi$  is finite. From the above, it follows that the fourier-series expansion for  $\mathcal{L}e_{\chi n}$  is absolutely and uniformly convergent for

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any finite  $\xi$ . On the same lines of proof as above, taking the relevant difference equations, it can be proved that the series expansions (4.6) for  $Ce_{2n+1}$ ,  $Se_{2n+2}$ ,  $Se_{2n+1}$  are all absolutely and uniformly convergent. Since the expansions are uniformly convergent for a given g and for any finite  $\xi$ , the series can be differentiated term by term and the series expansions so obtained for the derivations are absolutely and uniformly convergent for any finite  $\xi$ .

4.4 It will now be shown that the solutions of equation (4.2) can be expressed as a rapidly converging Bessel function series. 9, 19, 19,

If  $\zeta = 2k \cosh \xi$ , where  $k^2 = 9 > 0$ , then the equation (4.2) becomes

$$\left(9^{2}-4k^{2}\right)\frac{d^{2}}{d^{2}} + 9\frac{d^{3}}{d^{2}} + \left\{9^{2}-(a+2q)\right\}^{2} = 0 \quad (4.8)$$

Suppose

$$J = \sum_{m=0}^{\infty} (-i)^{m} C_{2m} J_{2m} (g)$$
(4.9)

is a solution of the above equation (4.8). Substituting the value of  $\beta$  from (4.9) into (4.8), we obtain

$$\sum_{m=0}^{M} \int_{2m} \left[ \left( S^{2} - 4k^{2} \right) J_{2m}^{''} + S J_{2m}^{'} + \left( S^{2} - \beta^{2} \right) J_{2m} \right] = 0$$

$$(4.10)$$

where

$$p^2 = a + 2q = a + 2k^2$$

Since

 $\overline{\mathcal{J}_{2m}}$  are solutions of Bessel's equation,

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$g^2 \frac{d^2 g}{dg^2} + g \frac{dg}{dg} - (4m^2 - g^2)g = 0,$  $g^{2}J_{2m}'' + g^{2}J_{2m} + g^{2}J_{2m} = 4m^{2}J_{2m}$ 

(4.11)

Also  $4 J_{2m}'' = J_{2m-2} - 2 J_{2m} + J_{2m+2}$ (4.12)

or 
$$\leq (-i)^{m} C_{2m} \left[ (4m^{2}-a)J_{2m} - k^{2} (J_{2m-2} + J_{2m+2}) \right] = 0$$
 (4.14)  
 $m=0$ 

Equating the coefficients of  $\int_{\mathcal{Z}_m} to zero (m = 0, 1, 2, ....)$ 

$$ac_{0} - kc_{2} = 0$$
  
 $(a-4)c_{2} - k(c_{4} + 2c_{6}) = 0$  (4.15)

$$(\alpha - 4m^2)c_{2m} - k^2(c_{2m+2} + c_{2m-2}) = 0, m \ge 2$$

Comparing equations (4.15) and equations (4.7), they are found to be the same, with  $A_m$  in (4.7) replaced by  $c_m$ Hence  $C_{2m}$  are proportional to  $A_{2m}$ .

$$Ce_{2n}(\xi,q) = \sum_{m=0}^{\infty} A_{2m}^{(2n)} \cosh 2m\xi$$

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 $\mathcal{C}_{\mathcal{X}m}$  are proportional to  $A_{\mathcal{X}m}$  and it can be noticed that  $\cosh 2m\xi$  and  $\overline{J}_{2m}$  ( $\cosh 2m\xi$ ) are both periodic with period  $\mathcal{T}$  $\mathcal{K} \stackrel{\mathcal{A}}{\underset{m=0}{\overset{}{\simeq}}} (-i)^{m} A_{2m} \stackrel{\mathcal{J}}{\underset{m=0}{\overset{}{\sim}}} (2k \cosh \xi)$  are solutions of Hence the equation (4.2) If  $\xi = \frac{\pi i}{2}$ ,  $\frac{J}{2m}(o) = o$  for all m, except  $J_0(o)$  which is = 1 $Ce_{gn}\left(\frac{\pi i}{2},q\right) = Ce_{gn}\left(\frac{\pi}{2},q\right) / A_0^{(2n)}$ and Therefore Following arguments similar to above, we obtain the series solutions for  $le_{2n+1}$ ,  $Se_{2n+2}$ ,  $Se_{2n+1}$  as follows:  $Ce_{2n+1}(\xi,q) = \frac{Ce'_{2n+1}(\frac{1}{2},q)}{b} \stackrel{\alpha}{\xrightarrow{(2n+1)}} \stackrel{m}{\xrightarrow{(2n+1)}} \frac{J}{(2kcosh\xi)} (2kcosh\xi)$ (4.17) $Se_{2n+2}(\xi, \gamma) = - \frac{Se'_{2n+2}(\frac{\eta}{2}, \gamma)}{k^2 B_{2n+2}^{(2n+2)}} \tanh \xi X$  $\stackrel{\sim}{\leq} (-1)^{m} (2m+2) B_{2m+2}^{(2n+2)} \mathcal{J}_{2m+2}^{(2ktc.sh\xi)}$ (4.18)and  $Se_{2n+1}(\xi,q) = \frac{Se_{2n+1}(\frac{\pi}{2},q)}{kB^{(2n+1)}} \tanh \xi \times \frac{1}{kB^{(2n+1)}}$  $\stackrel{KD_{i}}{\leq} (-i)^{m} (2m+1) B_{2m+1} (2k \cosh \xi)$ (4.19)

4.5 Here a new set of functions are introduced, which are respectively proportional to functions (4.16) - (4.19), but are normalised differently.

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$$J_{e_{2n+p}}(\xi, q) = \sqrt{\frac{\pi}{2}} (-i)^{n} \sum_{m=0}^{\infty} (-i)^{m} De_{2m+p} J_{2m+p}(2k\cosh\xi),$$

$$p = 0 \text{ or } i.$$

$$J_{o_{2n+p}}(\xi, q) = \sqrt{\frac{\pi}{2}} (-i)^{n} \tanh\xi \sum_{m=0}^{\infty} (-i)^{m} (2m+p) \times$$

$$m=0$$
(4.20)

$$\begin{array}{c} m=0 \\ Do \\ 2m+p \end{array} \begin{array}{c} J \\ 2m+p \end{array} \begin{pmatrix} 2k \cos k \xi \end{pmatrix} \quad (4.21) \end{array}$$

As in Article 4.4, it can be proved, by direct substitution in equation (4.2), that expansion (4.20) and (4.21) are solutions of the equation (4.2) and again as these are periodic functions with period  $\pi i$  or  $2\pi i$  corresponding to the functions with the same period, it follows that  $\overline{Je}_{2n}$  are proportional to  $Ce_{2n}$ ,  $\overline{Jo}_{2n+1}$  to  $Se_{2n+1}$ 

Jezn+1 to Cezn+1 and Jozn+2 to So 2n+2

The  $\overline{Je}$  and  $\overline{Jo}$  have been used in the computations in this work, as they are more convenient than the Ce and Se .

The convergence of the above series is discussed at the end of this chapter.

4.6 Consider the reduced wave equation

$$\frac{\partial^2 G}{\partial x^2} + \frac{\partial^2 G}{\partial y^2} + k_i^2 G = 0 \qquad (4.22)$$

From Chapter II, it is known that this equation takes the form  $\frac{\partial^2 G}{\partial \chi^2} + \frac{\partial^2 G}{\partial y^2} + 2\gamma \left(\cosh 2\chi - \cos 2y\right) G = 0 \quad (4.23)$ 

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where k, h = 2/q, when the cartesian coordinates (x,y) are transformed to elliptic coordinates ( $\chi, \zeta$ ). If in the above,  $\chi = 2\zeta$ , so that  $\chi = heos\zeta cos\zeta$ ,  $y = 2h, \sin \zeta$  (these are the modified elliptic coordinates) equation (4.23) takes the form

$$\frac{\partial^2 G}{\partial \xi^2} - \frac{\partial^2 G}{\partial \xi^2} + \lambda q \left(\cos \lambda \xi - \cos \lambda \xi\right) G = 0 \qquad (4.24)$$

It shall now be proved that any solution of the above equation (4.24) forms a nucleus for an integral equation involving a solution of the Mathieu's equation:<sup>219</sup> The main aim of this theorem is to obtain a series expansion for the modified Mathieu function in a product of Bessel functions.

4.7 If (i)  $\phi(\xi)$  is a function satisfying the Mathieu's equation for a particular value of a and q

(ii)  $G(\xi, S)$  is an analytic function of  $\xi, S$ (  $\xi$  belongs to a region X in the complex  $\xi$ -plane, Sbelongs to a region Z in the complex S -plane) satisfying equation (4.24)

and (iii) (a) the values of the expression  $\left[ \mathcal{G}(\xi, \xi) \times \frac{d}{d\xi} \phi(\xi) - \frac{\partial \mathcal{G}(\xi, \xi)}{\partial \xi} \phi(\xi) \right]$  at the ends of a path C of integration, lying wholly within the Z-region of the  $\zeta$ -plane, are the same

and also (b)  $\int_{C} G(\xi,\xi) \phi(\xi) d\xi$  exists for all  $\xi$  in X, and the integral converges uniformly in  $\xi$  for all  $\xi$  in X, if it is singular;

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then

$$\alpha(\bar{s}) = \int_{\mathcal{C}} G(\bar{s}, \bar{s}) \phi(\bar{s}) d\bar{s}$$

satisfies the Mathieu's equation for all  $\xi$  in X for the same a and q for which  $\phi(\xi)$  satisfies Mathieu's equation.

Now the proof.

Because of the hypothesis (iii) (b), the integral  $\int_{C} (\xi, \xi) \phi(\xi) d\xi$  can be differentiated under the integral sign.

Hence 
$$\frac{dl^{2}x}{d\xi^{2}} = \int \frac{\partial^{2}q}{\partial\xi^{2}} (\xi, \xi) \phi(\xi) d\xi$$
  
Therefore 
$$\frac{dl^{2}x}{d\xi^{2}} + (a - 2q \cos 2\xi)x = \int_{C} \{\frac{\partial^{2}q}{\partial\xi^{2}} + (a - 2q \cos 2\xi)G\} x$$
  

$$\varphi(\xi) d\xi_{3}$$
  

$$= \int_{C} \{\frac{\partial^{2}G}{\partial\xi^{2}} + (a - 2q \cos 2\xi)G\} \{\phi(\xi), d\xi\} (4.25)$$
  
(from hypothesis (ii))  
Integrating 
$$\int_{C} \frac{\partial^{2}G}{\partial\xi^{2}} \phi(\xi)d\xi = \left[\frac{\partial G}{\partial\xi} \phi(\xi)\right]_{C} - \int_{C} \frac{\partial G}{\partial\xi} \phi'(\xi)d\xi$$
  

$$= \left[\frac{\partial G}{\partial\xi} \phi(\xi)\right]_{C} - \left[G \phi'(\xi)\right]_{C} + \int_{C} G \phi''(\xi)d\xi$$
  

$$= \left[\frac{\partial (\xi)}{\partial\xi} - G d\xi\right]_{C} + \int_{C} G \phi''(\xi)d\xi$$
  

$$= \int_{C} \frac{d^{2}\phi}{d\xi^{2}} - G d\xi (4.26)$$

(due to hypothesis (iii) (a))

so 
$$\frac{d^2x}{d\xi^2} + (a - 2q \cos 2\xi)x = \int \left[\frac{d^2q}{d\xi^2} + (a - 2q \cos 2\xi)\phi\right]Gdg$$
  
C (from (4.25) and (4.26))

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By hypothesis (i),  $\phi$  satisfies Mathieu's equation hence the integral on the right vanishes and

 $\frac{d^2x}{d\xi^2} + (\alpha - 2g\cos 2\xi)x = 0$ 

which shows that x satisfies the Mathieu's equation. From above it follows that:

If  $\phi(\xi)$  is a basically periodic solution of Mathieu's equation,  $G(\xi,\xi)$  is symmetric in  $\xi$ ,  $\xi$ , with the same period as  $\phi(\xi)$ , and the integration is over any finite period of  $\phi(\xi)$ , then  $\phi(\xi)$  satisfies the integral equation

$$\phi(\xi) = \lambda \int_{C} G(\xi, \xi) \phi(\xi) d\xi \qquad (4.27)$$

where the integral is not improper.

As the integrand is basically periodic in  $\xi$ , the integral itself is basically periodic in  $\xi$ . By the theorem above, it satisfies the same Mathieu equation as  $\phi(\xi)$ . Since there is only one basically periodic solution of this equation, the integral itself is a multiple of  $\phi(\xi)$ . Hence the equation (4.27). It may happen that the integral itself is zero, in which case  $\lambda$  can be taken to be infinite and the result holds.

4.8 Thus we know that any basically periodic solution of equation (4.24) in modified elliptic coordinates can be the nucleus of the integral equation (4.27).

Consider a solution of the reduced wave equation (4.22) in cylindrical polar coordinates.

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 $x = p \cos \theta$  and  $y = p \sin \theta$ , Now which reduces the equation (4.22) to two second order linear equations  $\frac{d^{2}R}{dP^{2}} + \frac{1}{P}\frac{dR}{dP} + \left(k_{1}^{2} - \frac{\gamma^{2}}{P^{2}}\right)R = 0$  $\frac{d^2 T}{d \theta^2} + y^2 T = 0 \qquad (y) \text{ a positive integer}$ (see Chapter I) and where G = R(p) T(G)Hence the solution of equation (4.22) can be given as  $J_{y}(k,p)/\cos(v\theta)$  $Y(k,p) \int pin(x0)$ since x = h cost cost, y= ihoint ping  $P = h \left[ \frac{1}{2} \left( \cos 2\xi + \cos 2\xi \right) \right]^{1/2}$ (4.28)and since k, h = 2/q, kip = [29 (cos 23 + cos 29)] 1/2 The expressions for  $\cos\theta$  and  $\sin\theta$  are given as follows:  $\cos \theta = \frac{\cos \xi \cos \xi}{\left[\frac{1}{2} \left(\cos 2\xi + \cos 2\xi\right)\right]^{1/2}} \left(\frac{z}{\rho}\right)$  $\sin \theta = \frac{i \sin \frac{3}{5} \sin 5}{\left[\frac{1}{2} \left(\cos 2\frac{3}{5} + \cos 2\frac{3}{5}\right)\right]^{1/2}} \left(\frac{-\frac{9}{7}}{7}\right)$ 

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DeMoivre's therem gives  $\cos \theta + i \sin \theta = (\cos \theta + i \sin \theta)$ Hence equating the real and imaginary parts and substituting the values of  $\cos \theta$  and  $\sin \theta$ , the expressions for  $\cos \theta$  and  $\sin \theta$  are obtained. Consider the expression

 $\int_{2\nu}^{\nu} J_{\lambda\nu}(k,p) \cos 2\nu \theta c e_{\lambda\nu}(g,q) dg$ 

Obviously  $\mathcal{C}\ell_{2\mathcal{Y}}(S,q)$  satisfies condition (i) Article 4.7.  $\mathcal{J}_{2\mathcal{Y}}(k,p)$  is symmetric in  $\xi$  and  $\mathcal{G}$  (since p is symmetric in  $\xi$  and  $\mathcal{G}$ ) and since  $\cos \mathcal{D}\theta = C\partial \mathcal{G}$   $\left\{\mathcal{V}cos^{-1}\left(\frac{\sqrt{2}\cos\xi}{(cos\xi+cos\xi)/2}\right)\right\}$ , so is  $\cos \mathcal{D}\theta$  and for that matter, so is  $\sin \mathcal{V}\theta$ . Hence  $\mathcal{J}_{2\mathcal{Y}}(k,p)cos\mathcal{D}\mathcal{D}$  satisfies condition (ii) Article 4.7.

Since  $\rho$ ,  $\theta$  are periodic in  $\xi$  with period  $\pi i 2$ , so is  $J_{\mu\nu}(k_{\mu}\rho)\cos\nu\theta$ .

Hence condition (iii) (a) of article 4.7 is satisfied and so is condition (iii) (b), due to the nature of the function  $J_{2\nu}(k\rho)\cos 2\nu\theta$ . As a result of Article 4.7,  $ce_{2\nu}$ , therefore satisfies the integral equation

$$Ce_{2n}(\xi,q) = \lambda \int_{0}^{n} \int_{2\nu}^{n} (k_{p}) \cos 2\nu \theta ce_{2n}(\xi,q) d\xi$$
 (4.29)

4.9 In the equation (4.29) let v = 0. Then that equation can be written as

 $ce_{2n}(\xi,q) = \lambda \int_{0}^{\pi} \int_{0}^{\pi} \left[ \left\{ 2q \left( \cos 2\xi + \cos 2\xi \right) \right\}_{2}^{1/2} \right] ce_{2n}(\xi,q) d\xi$  (4.30)

Consider the addition formula for Bessel function of the

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First kind and order zero.  

$$J_{0}\left[(x^{2}+y^{2}+2xy\cos\theta)^{N_{0}}\right] = J_{0}(x)J_{0}(y) + 2\sum_{j,2=1}^{d}(-y^{j}J_{j}(x)J_{j}(y)\cos\theta) \quad (4.31)$$
Let  $x = ke^{2\frac{x}{2}}, y = ke^{-\frac{2x}{2}}$ , then  

$$J_{0}\left[(x^{2}+y^{2}+2xy\cos\theta)^{N_{0}}\right] = J_{0}\left[(ke^{2\frac{y}{2}}+ke^{-\frac{y}{2}\frac{x}{2}}+2ke\cos\theta)^{N_{0}}\right]$$
If  $\theta = 2\beta$  and  $k^{\frac{1}{2}} = p$   

$$J_{0}\left[(x^{2}+y^{2}+2xy\cos\theta)^{N_{0}}\right] = J_{0}\left[\left\{2q(\cos\lambda\frac{x}{2}+\cos\theta)^{N_{0}}\right\}\right]$$
Therefore applying formula (4.31),  

$$J_{0}\left[\left\{2q(\cos\lambda\frac{x}{2}+\cos2\theta)^{N_{0}}\right\}\right] = J_{0}\left[\left\{2q(\cos\lambda\frac{x}{2}+\cos2\theta)^{N_{0}}\right\}\right]$$
If  $\frac{y}{2} = J_{0}\left(he^{\frac{1}{2}\frac{y}{2}}\right) J_{0}\left(he^{\frac{1}{2}\frac{y}{2}}\right) + 2\sum_{k=1}^{d}(-1)^{N_{0}}J_{k}\left(he^{\frac{1}{2}\frac{y}{2}}\right) J_{k}\left(he^{-\frac{1}{2}\frac{y}{2}}\right)\cos2hS$   
If  $\frac{y}{2} = 0$ ,  

$$J_{0}\left(2\lambda\cos\lambda\frac{y}{2}\right) = J_{0}^{2}(k) + 2\sum_{k=1}^{d}(-1)^{N_{0}}J_{k}^{2}(k)\cos\theta N$$
Therefore, from the integral equation (4.29)  

$$ce_{xn}\begin{pmatrix}0,y\\1\\0,z\\1\\0\end{pmatrix}\begin{pmatrix}T_{0}-z^{2}(k)+2\sum_{k=1}^{d}(-1)^{N_{0}}J_{k}^{2}(k)\cos\theta N S \\ M_{0}-z^{2}m \int_{0}^{d}z^{2}(k) + 2\sum_{k=1}^{d}(-1)^{N_{0}}J_{k}^{2}(k)\cos\theta N S \\ M_{0}-z^{2}m \int_{0}^{d}z^{2}(k)\cos\theta N S \\$$

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$$\int_{0}^{\pi} \cos 2\pi \xi \, d\xi = 0 \tag{4.33}$$

Hence  

$$\int_{0}^{\pi} \int_{-\infty}^{2} (k) + 2 \sum_{\substack{k=l \ h=l}}^{\infty} (-i)^{k} J_{n}^{2}(k) \cos 2\pi \sum \cos 2\pi \int dS = (-i)^{m} J_{m}^{2}(k)$$
Therefore  

$$Ce_{2n}(0,q) = \lambda_{2n} \pi \sum_{\substack{m=0 \ m=0}}^{\infty} (-i)^{m} A_{2m}^{2} J_{m}^{2}(k)$$
and so  

$$\lambda_{2n} = \frac{Ce_{2n}(0,q)}{\pi \sum (-i)^{m} A_{2m}^{(2n)} J_{m}^{2}(k)} \text{ where } q = k^{2} \qquad (4.34)$$

Therefore

$$\sum_{m=0}^{\infty} A_{2m}^{(2n)} \cos 2m\xi = \frac{Ce_{2n}(\frac{\pi}{2}, \frac{q}{2})}{A_0^{(2n)}} \sum_{m=0}^{\infty} (-1)A_{2m}^{(2n)} \mathcal{J}_m(2k\cos\xi)$$

As the series on both sides of the above equation are uniformly convergent (see articles 4.3, 4.12), term by term integration is permissible. Integrating both sides with respect to  $\xi$  from 0 to 77, we get  $\int_{0}^{\frac{77}{2}} \int_{2m}^{(2n)} Cos 2m\xi d\xi = \frac{Cc}{2n} \left(\frac{77}{2}\right) \int_{0}^{\infty} \int_{m=0}^{\infty} (-1)^{m} A_{2m}^{(2n)} \int_{2m}^{(2k \cos \xi)} d\xi$ 

 $\pi A_0^{(2n)} = \frac{\operatorname{Ce}_{2n}(\frac{\pi}{2}, q)}{\operatorname{O}^{(2n)}} \pi \stackrel{\sim}{\underset{m=0}{\overset{\sim}{=}}} (-i)^m A_{2m}^{(2n)} \mathcal{J}_m^2(k)$ 

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Therefore  

$$\sum_{n=0}^{\infty} (-i)^{n} A_{2m}^{(2n)} J_{m}^{2}(k) = \frac{\left[A_{0}^{(2n)}\right]^{2}}{ce_{2n}\left(\frac{\pi}{2},9\right)}$$
Hence  

$$\lambda_{2n} = \frac{ce_{2n}\left(0,q\right) ce_{2n}\left(\frac{\pi}{2},9\right)}{\pi \left[A_{0}^{(2n)}\right]^{2}}$$
(4.35)  
Hence, from equation (4.30),  

$$Ce_{2n}\left(\xi,q\right) = \frac{ce_{2n}\left(0,q\right) ce_{2n}\left(\frac{\pi}{2},9\right)}{\pi \left[A_{0}^{(2n)}\right]^{2}} \times \int_{0}^{\pi} J_{0}\left[k \left\{\frac{2}{2}\left(\cos 2\xi + \cos 2\xi\right)\right\}^{2} J_{0}\left[ce_{2n}\left(\xi,q\right)\right]d\xi}$$
Since  $ce_{2n}\left(\xi,q\right) = \frac{ee_{2n}\left(\cos 2\eta\right)^{2}}{m=0} A_{2m}^{(2n)} co \delta 2m \xi$   
and  

$$J_{0}\left[k \left\{\frac{2}{2}\left(\cos 4\xi + \cos 2\xi\right)\right\}^{2} J_{0}^{2} = J_{0}\left(ke^{\frac{2}{2}\xi}\right) J_{0}\left(ke^{-\frac{2}{2}\xi}\right) co \xi 2h \xi\right]$$

$$+ 2 \frac{ee_{2n}\left(5,q\right) ce_{2n}\left(\frac{\pi}{2},q\right)}{\pi \left[A_{0}^{(2n)}\right]^{2}} \times \int_{0}^{\pi} J_{0}^{2} (ke^{\frac{2}{2}\xi}) J_{0}(ke^{-\frac{2}{2}\xi})$$

$$+ 2 \frac{ee_{2n}\left(5,q\right) ce_{2n}\left(\frac{\pi}{2},q\right)}{\pi \left[A_{0}^{(2n)}\right]^{2}} \times \int_{0}^{\pi} J_{0}^{2} (ke^{\frac{2}{2}\xi}) J_{0}(ke^{-\frac{2}{2}\xi})$$

$$+ 2 \frac{ee_{2n}\left(5,q\right) ce_{2n}\left(\frac{\pi}{2},q\right)}{\pi \left[A_{0}^{(2n)}\right]^{2}} \times \int_{0}^{\pi} J_{0}^{2} (ke^{\frac{2}{2}\xi}) J_{0}(ke^{-\frac{2}{2}\xi})$$

$$+ 2 \frac{ee_{2n}\left(5,q\right) ce_{2n}\left(\frac{\pi}{2},q\right)}{\pi \left[A_{0}^{(2n)}\right]^{2}} \times \int_{0}^{\pi} J_{0}^{2} (ee^{2\xi}) J_{0}(ke^{-\frac{2}{2}\xi})$$

$$+ 2 \frac{ee_{2n}\left(5,q\right) ce_{2n}\left(\frac{\pi}{2},q\right)}{\pi \left[A_{0}^{(2n)}\right]^{2}} \times \int_{0}^{\pi} J_{0}^{2} (ee^{2\xi}) J_{0}(ee^{2\xi}) J_{0}(ee^{2\xi}) J_{0}(ee^{2\xi})$$

$$+ 2 \frac{ee_{2n}\left(\frac{\pi}{2},\frac{\pi}{2}\right)}{\pi \left[A_{0}^{(2n)}\right]^{2}} \times \int_{0}^{\pi} J_{0}^{2} (ee^{2\xi}) J_{0}(ee^{2\xi}) J_{0}(ee$$

In the above equation, the first term gives

 $\lambda_{2n} J_0(ke^{2\xi}) J_0(ke^{-2\xi}) \pi A_0^{(2n)}$ , from equation (4.33)

and the second term gives

 $\lambda_{2n} \pi \stackrel{\otimes}{\underset{\scriptstyle b=1}{\overset{\scriptstyle (-1)}{\overset{\scriptstyle n}{\overset{\scriptstyle }}}} J_{r}(ke^{i\xi}) J_{r}(ke^{-i\xi}) A_{2r}^{(2n)}$ Hence  $\mathcal{C}_{2n}(\xi,q) = \lambda_{2n} \pi \overset{\otimes}{=} (-i)^{2} A_{2n}^{(2n)} J_{n}(ke^{2\xi}) J_{n}(ke^{-2\xi})$ (4.36)

If in equation (4.36) we write  $2\xi$  for  $\xi$ , the equation becomes

$$Ce_{2n}\left(\xi,q\right) = \pi \lambda_{2n} \sum_{h=0}^{\infty} (-i)^{h} A_{2h} J_{h}(ke\xi) J(ke\xi)$$

$$(4.37)$$

where  $\lambda_{2n}$  has the value given by equations (4.34) or (4.35).

This is the expansion for  $\operatorname{Ce}_{2n}(\xi, \varphi)$  in Bessel function product series.

4.10 Obtaining a series of the form (4.37) for the other is not as straight forward as above.

We obtain, for  $C_{e_{3n+1}}$ , (say), a series of the form constant x cosh  $\xi \stackrel{\mathcal{D}}{\underset{k=n}{\leq}} \overline{A}_{2n+1}^{(2n+1)} \mathcal{J}_{n+1}(ke^{i\xi}) \mathcal{J}_{n+1}(ke^{-i\xi})$ 

 $\overline{A}_{2n+1}^{(2n+1)}$  are not the same as  $\overline{A}_{2n+1}^{(2n+1)}$ . This can where be obtained using the method described in articles 4.7, 4.8 and 4.9.

We can also have expansions with the same coefficients, but in this case the expansion functions are more complicated. In what follows, a series expansion for  $Ce_{2n+1}(\xi,q)$ is obtained.

As in articles 4.7 and 4.8, it can be proved that

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 $Ce_{2n+1}(\xi,q) = \phi_{2n+1} \int_{2\nu+1}^{2\nu} (k_{p}) \cos(2\nu+1) \theta \leq A \cos(2s+1) \eta d\eta$ If we write  $\frac{1}{2}$  for  $\frac{1}{2}$  $Ce_{2n+1}(5,q)$  $= \phi_{2n+1} \left( \int_{2\nu+1}^{2\pi} (k_{p}) \cos(2\nu+1) \phi \leq A \cos(2\beta+1) \eta d\eta \right)$ where where  $k_{p} = k \left[ 2(\cos 2\eta + \cosh 2\xi) \right]^{\frac{1}{2}} = k \left( e^{2\xi} + e^{-2\xi} + 2\cos 2\eta \right)^{\frac{1}{2}}$ For any cylinder function  $\frac{Z_{2}(\omega)}{\omega^{2}} = 2^{2} \left[ (2) \frac{\mathcal{S}}{\underline{E}} \left( -i \right)^{m} (m+2) J_{m+2}(v_{i}) Z_{m+2}(v_{2}) \right]_{m+2} \left( \frac{v_{2}}{m} \right)^{2} \left( \frac{(co)(2\pi)}{m} \right)$ (4.38) where  $\omega^2 = v_1^2 + v_2^2 + 2v_1 v_2 \cos 2\eta$ ,  $|v_1| < |v_2|$  $\mathcal{C}_m^{\mathcal{V}}$  are the Gegenbauer's polynomials, (coefficients of in the expansion of  $(1 - 2 \times co \pm 2\eta + \chi^2)^{\nu}$  in the ascending powers of x), so that  $C_{m}^{\nu}(\cos 2\eta) = \sum_{s=0}^{\leq m/2} \frac{(-1)^{s} 2^{m-2s}}{(m-2s)! s! f(\nu)} \frac{(m+\nu-s) \cos^{m-2s} 2\eta}{(m-2s)! s! f(\nu)}$ In particular if  $\mathcal{V} = 1$ ,  $\binom{1}{m}(\cos 2\eta) = \sum_{s=0}^{\leq m/2} \frac{(-1)^{s} 2^{m-2s} \int (m+1-s) \cos^{m-2s} 2\eta}{(m-2s)! s!}$ From the above we obtain  $\frac{\cos \eta}{m} \left( \cos 2\eta \right) = \frac{\sin (2m+2)\eta}{2\sin \eta} = \frac{1}{p} \cos (2p+1)\eta$  $(As \leq 2 \sin \eta \cos(2p+1)\eta = \sin 2\eta + (\sin 4\eta - \sin 2\eta) + \frac{1}{p=0}$ - + [pin (2m+2)) - pin 2m]

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= sin  $(2m+2)\eta$ 

$$\begin{aligned} coso &= \frac{x}{\rho} = \frac{h}{\rho} \cosh \xi \cosh \eta = \frac{2k \cosh \xi \cosh \eta}{k_{1}\rho} \\ \text{If in equation } (4.38) Z_{y} = J_{y}, \quad \forall_{1} = k e^{-\frac{\pi}{2}}, \quad \forall_{2} = k e^{\frac{\pi}{2}} \text{ and } y = 1 \\ J_{1}(k_{1}\rho)coso &= \frac{J_{1}(k_{1}\rho)}{k_{1}\rho}, \quad 2k \cosh \xi \cosh \eta \\ &= \frac{2k \cosh \xi}{m_{2}\rho}, \quad \frac{\chi}{2} \equiv \frac{(-1)(m_{1})J_{m+1}(v_{1})}{m_{2}} \times \\ C_{m}^{1}(\cos 2\eta)cos\eta, \\ &= \frac{4}{k}\cosh \xi \equiv \frac{\omega}{m_{2}\rho} (-1)(m_{1})\omega_{m+1} \leq \cos(2p+1)\eta \\ &= \frac{4}{k}\cosh \xi \equiv \frac{\omega}{m_{2}\rho} (-1)(m_{2}) + 1 \sum_{m=0}^{m} \cos(2p+1)\eta \\ &= \frac{4}{k}\cosh \xi \equiv \frac{\omega}{m_{2}\rho} (-1)(m_{2}) + 1 \sum_{m=0}^{m} \cos(2p+1)\eta \\ &= \frac{4}{k}\cosh \xi \equiv \frac{\omega}{m_{2}\rho} (-1)(m_{2}) + 1 \sum_{m=0}^{m} \cos(2p+1)\eta \\ &= \frac{4}{k}\cosh \xi \equiv \frac{\omega}{m_{2}\rho} (-1)(m_{2}) + 1 \sum_{m=0}^{m} \cos(2p+1)\eta \\ &= \frac{4}{k}\cosh \xi \equiv \frac{\omega}{m_{2}\rho} (-1)(m_{2}) + 1 \sum_{m=0}^{m} \cos(2p+1)\eta \\ &= \frac{4}{k}\cosh \xi \equiv \frac{\omega}{m_{2}\rho} (-1)(m_{2}) + 1 \sum_{m=0}^{m} \cos(2p+1)\eta \\ &= \frac{4}{k}\cosh \xi \equiv \frac{\omega}{m_{2}\rho} (-1)(m_{2}) + 1 \sum_{m=0}^{m} \cos(2p+1)\eta \\ &= \frac{4}{k}\cosh \xi = \frac{1}{k} - \frac{1}{k} + 1 \sum_{m=0}^{m} (-1)(m_{2}) + 1 \sum_{m=0}^{m} \cos(2p+1)\eta \\ &= \frac{1}{k}\cosh \xi = \frac{1}{k} - \frac{1}{k} + 1 \sum_{m=0}^{m} (-1)(m_{2}) + 1 \sum_{m=0}^{m} \cos(2p+1)\eta \\ &= \frac{1}{k}\cosh \xi = \frac{1}{k} - \frac{1}{k} + 1 \sum_{m=0}^{m} (-1)(m_{2}) + 1 \sum_{m=0}^{m$$

Hence

$$\begin{aligned} (e_{2n+1}(\xi, \gamma)) &= \phi_{2n+1} \frac{4}{k} \cosh \xi \frac{\infty}{2n-0} (m+1) \omega_{m+1} \times \\ &\int_{m=0}^{2\pi} \int_{m=0}^{2\pi} \cos((2p+1)\eta) \frac{\infty}{2n-0} A_{2n+1} \cos((2n+1)\eta) d\eta \end{aligned}$$

As  

$$\int_{0}^{2\pi} \cos(2p+1)\eta \cos(2s+1)\eta d\eta = \begin{cases} 0, p \neq s \\ \pi, p = s \end{cases}$$
Now  

$$(m+1) \int_{0}^{2\pi} \sum_{p=0}^{m} \cos(2p+1)\eta \leq A_{2s+1} \cos(2s+1)\eta d\eta$$

$$= \pi(m+1) (A_{1} + A_{3} + A_{5} + \cdots + A_{2m+1})$$

$$= \pi \overline{A} \frac{(2n+1)}{2m+1}$$
 (say)

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Then

$$\begin{split} & \mathcal{C}e_{2n+1}\left(\xi_{1}\gamma\right) = \phi_{2n+1} \frac{4\pi \cosh \xi}{k} \underbrace{\leq}_{m=0}^{\infty} (-i) \underbrace{A_{2m+1}^{(2n+1)}}_{m+1} \underbrace{J_{n+1}^{(ke^{-\xi})}}_{m+1} \underbrace{J_{n+1}^{(ke^{-\xi})}}_{m+1} \\ & \text{where } \underbrace{A_{2m+1}^{(2n+1)}}_{2m+1} = (m+1) \left( A_{1}^{(2n+1)} + A_{3}^{(2n+1)} + A_{5}^{(2n+1)} + A_{2m+1}^{(2n+1)} \right) \\ & \text{To obtain the series with } A_{2n+1}^{(2n+1)} \text{ as coefficients,}^{19} \\ & \text{consider } W_{n} = J_{2}(v_{1}) \underbrace{J_{n+1}(v_{2}) + J_{n+1}(v_{1})}_{2n} \underbrace{J_{n}(v_{2})}_{2n} \underbrace{J_{n}(v_{$$

$$= \frac{4}{k} \cosh \xi \left[ A_{1}^{(2n+i)} (\omega_{i} - 2\omega_{2} + 3\omega_{3} - \cdots) - A_{3}^{(2n+i)} (2\omega_{2} - 3\omega_{3} + 4\omega_{4} - \cdots) \right] \\ + A_{5}^{(2n+i)} (3\omega_{3} - 4\omega_{4} + \cdots) - \cdots ] \\ = \frac{4}{k} \cosh \xi \sum_{m=0}^{\infty} (-i)^{m} (m+i) (A_{1}^{(2n+i)} + A_{3}^{(2n+i)} + A_{2m+i}^{(2n+i)}) \omega_{m+i} \\ = \frac{4}{k} \cosh \xi \sum_{m=0}^{\infty} (-i)^{m} \overline{A}_{2m+i}^{(2n+i)} \overline{J}_{m+i} (ke^{\xi}) \overline{J}_{m+i} (ke^{-\xi}) \\ - 47 -$$

Hence  $Ce_{2n+1}(\xi,q) = \pi \phi_{2n+1} \overset{o?}{\underset{m=0}{\underset{m=0}{\overset{m}{\leq}}} (-i) \overset{m}{A} \overset{(2n+1)}{\underset{m=0}{\overset{W}{\atop}} W$ 

where  $W_{m} = J_{m}(ke^{-\xi})J_{m+1}(ke^{\xi}) + J_{m}(ke^{\xi})J_{m+1}(ke^{-\xi})$ The value of  $\oint_{2n+1}$  can be found as in Article (4.9),  $\oint_{2n+1}$  corresponds to  $\lambda_{2n} \cdot \oint_{2n+1} = -\frac{Ce_{2n+1}(0, 9)Ce_{2n+1}(\frac{\pi}{2}, 9)}{\pi k \left[A_{1}^{(2n+1)}\right]^{2}}$ On the same lines as these the expansions for Se and

On the same lines as these, the expansions for  $Se_{2n+1}$  and  $Se_{2n+2}$  are obtained and are given as follows:

$$Se_{2n+1}(\xi,q) = \frac{se'_{2n+1}(0,q) \cdot se_{2n+1}(\frac{\pi}{2},q)}{k \left[B_{1}^{(2n+1)}\right]^{2}} \approx \frac{m}{m=0}^{(2n+1)} \sum_{m=0}^{\infty} (-1) B_{2m+1}^{(2n+1)} m$$

where

$$W_{m} = J_{m}(v_{1})J_{m+1}(v_{2}) - J_{m+1}(v_{1})J_{m}(v_{2})$$

and

$$S_{2,n+2}(\xi,q) = -\frac{\beta e_{2,n+2}(0,q) \beta e_{2,n+2}(\frac{1}{2},q) e_{0}}{k^{2} \left[ \beta_{2}^{(2,n+2)} \right]^{2}} \sum_{m=0}^{\infty} \sum_{m=0}^{\infty} \beta_{2,m+2}^{(2,n+2)} W_{m}$$

$$W_{m} = J_{m} (v_{1}) J_{m+2} (v_{2}) - J_{m+2} (v_{1}) J_{m} (v_{2})$$

These expansions of the modified Mathieu functions can also be obtained by another method - see Dougall 8, McLachlan 19.

4.11 As in Article 4.5, functions  $J_{e_{2n}}$ ,  $J_{e_{2n+1}}$ ,  $J_{O_{2n+2}}$ ,  $J_{O_{2n+1}}$  can now be written down as  $J_{e_{2n}}(5,\xi) = \int_{2}^{\frac{\pi}{2}} \frac{(-1)^n}{De_{0}} \frac{\mathcal{A}}{f_{2}=0} (-1)^{\frac{1}{2}} D_{e_{0}} J_{n}(u) J_{n}(v)$ 

$$Je_{2n+1}(5,\overline{5}) = \frac{(-1)^{n}}{De_{1}} \int_{\overline{x}}^{\overline{n}} \sum_{h=0}^{\infty} (-1)^{h} De_{2n+1} \times \left[ J_{n+1}(u) J_{n}(v) + J_{n}(u) J_{n+1}(v) \right]$$

(4.39)

$$J_{o_{2n+2}}(\Delta,\xi) = \frac{(-i)^n}{Do_2} \int_{2}^{\pi} \frac{\omega}{h=0} \int_{2}^{h} Do_{2n+2} \times \begin{bmatrix} J_{n+2}(u) J_n(v) - J_{n+2}(v) J_n(u) \end{bmatrix}$$

$$\int J_{n+2}(u) \int_{n}^{\pi} (v) - J_{n+2}(v) J_n(u) \end{bmatrix}$$

$$J_{o_{2n+1}}(\Delta,\xi) = \frac{(-i)^n}{Do_1} \int_{2}^{\pi} \frac{\omega}{h=0} (-i)^n Do_{2n+1} \times \begin{bmatrix} J_{n+1}(u) J_n(v) - J_n(u) J_{n+1}(v) \end{bmatrix}$$
where  $u = \frac{\sqrt{h}}{2} e^{\frac{\pi}{2}}$  and  $v = \frac{\sqrt{h}}{2} e^{-\frac{\pi}{2}}$ 

Though for computational work these expansions are not convenient, they are helpful in as much as they provide an independent means of evaluating the functions. In the next article it will be proved that these expansions converge much faster than expansions in Article 4.5. 4.12 Let  $\mathcal{U}_{\mathcal{X}}$  denote the  $\mathcal{X}$ th term in the expansion of  $Je_{\mathcal{X}n+\dot{p}}$ , equation (4.20) Then

$$u_n = \sqrt{\frac{\pi}{2}} (-1)^{n+n} De_{2n+p} \frac{J}{2n+p} (2k \cosh \xi)$$

$$u_{n+1} = \sqrt{\frac{\pi}{2}} (-1)^{n+1} De_{2n+p+2} J_{2n+2+p}^{(2k \cosh \xi)}$$

When 2h is very large in comparison with the argument  $2k \cosh \xi$  of the Bessel function,

 $J_{2n+p}(2k \cosh\xi)$  is (asymptotically) =  $\frac{1}{(2n+p)!} (k \cosh\xi)^{2n+p} 18$ 

Hence 
$$\frac{\mathcal{U}_{\lambda+1}}{\mathcal{U}_{\lambda}} = -\frac{De_{\lambda+p+\lambda}}{De_{\lambda+p+\lambda}} \frac{(k\cosh \xi)^{2}}{(2\lambda+p+\lambda)(2\lambda+p+1)}$$
  
But 
$$\frac{De_{\lambda+p+\lambda}}{De_{\lambda+p+\lambda}} \stackrel{l}{\rightarrow} \frac{|k|^{2}}{4(\lambda+l)^{2}} as \lambda \rightarrow \infty$$
  
Hence 
$$\frac{|\mathcal{U}_{\lambda+l}|}{\mathcal{U}_{\lambda}} \stackrel{l}{\rightarrow} \frac{|k^{4}| |\cosh^{2}\xi|}{4(\lambda+l)^{2}} whether p is 0 or 1.$$
  
(4.40)

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As  $\Lambda \to \infty$ , the above expression tends to zero, and so by the ratio test the series is absolutely convergent.

As  $\frac{|k^4| |\cosh^2 \xi|}{|6|(n+1)^4} \rightarrow 0$  faster than  $\frac{|k^2| \xi^{2|\xi|}}{|4|(n+1)^2|}$  (see Article 4.3) expansions (4.20), (4.21) converge faster than expansions (4.6).

Now, in any finite closed region of the  $\frac{3}{2}$ -plane, for a given  $\frac{9}{4}$ , it is possible to find an 'M', indepent of  $\frac{5}{2}$ such that  $\frac{|k^4||\cosh^2 \frac{3}{2}| \leq |6M(\Lambda + 1)^4|}{4}$  as  $\Lambda \to \infty$ Hence by 'M' test the series are uniformly convergent and term by term integration or differentiation with respect to  $\frac{3}{2}$  is permissible in any finite region of the  $\frac{3}{2}$ -plane.

Differentiating 
$$\int e_{2n}$$
 with respect to  $\xi$ ,  
 $\frac{d}{d\xi} \int e_{2n}(\xi,q) = 2k \sinh \xi (-1)^n / \frac{\pi}{2} \leq (-1)^n 2m De_{2m} \frac{\pi}{2m} \int (2k \cosh \xi)$   
Hence  $\left| \frac{u_{n+1}}{u_n} \right| = \left| \frac{De_{2n+2}}{De_{2n}} \cdot \frac{(2n+2)}{2n} \cdot k^2 \cosh^2 \xi \frac{(2n)!}{(2n+2)!} \right|$ 

(when 2h is very large compared to  $2k \cosh \xi$ )  $\simeq \frac{|k^4||\cosh \xi|^2}{|6(n+1)^4} (1+\frac{1}{2}) \rightarrow 0 \text{ as } h \rightarrow \infty . (4.41)$ 

Hence the above series is absolutely convergent and as above it can also be proved that it is uniformly convergent.

In a similar manner, it can be proved that the other modified Mathieu functions  $\mathcal{T}_{2n+1}^e$ ,  $\mathcal{T}_{2n+1}^o$  and  $\mathcal{T}_{2n+2}^o$  and their derivatives are absolutely and uniformly convergent.

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As the functions  $Ce_m$ ,  $Se_m$  differ from the above functions  $Te_m$ ,  $T_{Om}$  only by factors, which are independent of  $\xi$ , it can be proved that they and their derivatives are also uniformly and absolutely convergent.

Consider now the expansions given in a series of products of Bessel functions.

If  $W_n$  denotes the coefficient of  $A_{2h+p}$  or  $B_{2h+p}$  in the appropriate expansion,  $\left|\frac{W_{h+l}}{W_n}\right| \simeq \frac{q}{4(n+l)^2}$ Consider, for example  $W_n = J_n(v_1)J_{h+2}(v_2) - J_n(v_1)J_n(v_2)$ ,  $v_1 = ke^{-\xi}$ ,  $v_2 = ke^{\xi}$  and  $q = k^2$ If h is very large compared to  $v_1$  or  $v_2$ 

$$\begin{aligned} \mathcal{J}_{h}(\nu_{l}) &\simeq \frac{1}{h!} \left(\frac{k}{2}e^{\frac{\lambda}{2}}\right)^{h}, \quad \mathcal{J}_{h+2}(\nu_{2}) &\simeq \frac{1}{(h+2)!} \left(\frac{k}{2}e^{\frac{\lambda}{2}}\right)^{h} \\ \text{Hence} & \left| W_{h} \right| &\simeq \frac{1}{h!} \frac{1}{(h+2)!} \frac{k^{2h+2}}{2^{2h}} \left| e^{\frac{2\lambda}{2}} - e^{-\frac{2\lambda}{2}} \right| \\ \text{So} & \left| \frac{W_{h+1}}{W_{h}} \right| &\simeq \frac{k^{2}}{4(n+1)^{2}} \\ \text{Therefore} & \left| \frac{u_{h+1}}{H_{h}} \right| &\simeq \left| \frac{A_{2h+2}}{A_{2h}} \right| \frac{k^{2}}{4(h+1)^{2}} \end{aligned}$$

 $\frac{\sim}{l_{6}(\lambda+1)^{4}} \xrightarrow{k^{4}} 0 \text{ as } \lambda \rightarrow \infty$ (4.42)

Comparing (4.40) and (4.42), it can be seen that the series (4.39) converge more rapidly than (4.20), (4.21).

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The uniform convergence of the series and hence the absolute and uniform convergence of the derivatives is easily proved and it can also be proved that the derivatives of the series (4.39) converge faster than the derivatives of the series (4.20), (4.21).

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## METHOD OF FINDING THE HIGHER ORDER CUT-OFF FREQUENCIES.

5.

5.1 The three sets of expansions for the modified Mathieu functions (and hence their derivatives) obtained in Chapter IV, are uniformly and absolutely convergent for a given  $\eta$  and for any given order of the function, so long as  $\xi$  remains finite. For the evaluation of the functions any of these expansions can be used. The expansions (4.6) converge but slowly and even though expansions (4.39) converge extremely rapidly, they are not so convenient for computation purposes. Hence the expansions (4.20), (4.21) are the most appropriate ones for any computational work. The expansions (4.39) are independently obtained. Hence they are most useful when the accuracy of the results which have been obtained earlier by using expansions (4.20), (4.21) is to be checked.

5.2 As mentioned in Chapter III, the calculation of the cut-off frequencies are obtained by finding the parametric zeros of  $S_{1}^{\prime}$   $\left(\xi_{1}^{\prime}, \xi_{2}^{\prime}\right) = 0$  marginal matrix

 $Ce'_{m}(\xi_{0}, \gamma) = 0$  and  $Se'_{m+1}(\xi_{0}, \gamma) = 0$ ,  $m = 0, 1, 2, \cdots$ where  $\xi_{0}$  is such that if e is the eccentricity of the elliptic boundary,  $\cosh \xi_{0} = 1/e$ .

In the expansions of  $Ce_m(\xi, g)$  and  $Se_{m+1}(\xi, g)$  the coefficients themselves are functions of g and hence the functions can be evaluated for each  $\xi$ , only for a given g. So even if  $\xi_0$  is known it is not practicable to find the parametric zeros directly. So we adopt the following method.

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For a given order m, for each value of s, the value  $\omega_0 = \sqrt{3} \cos \frac{1}{2}$ , which makes the function  $Ce_m$  or  $Se_{m+1}$  zero is calculated.

From equation (3.10) which gives

$$2 = \frac{\sqrt{5}}{\omega_0}$$

the eccentricity e of the ellipse is calculated. Once e is known, from equation (3.11),  $k = \omega_o (1-e^2)^{1/4}$ the eigen values k (i.e. the cut-off frequencies) are found. But the e obtained here are not the required values, the values to be found being for ellipses of eccentricities  $\ell = \cdot / (\cdot I) \cdot 9$  and  $\ell = \cdot 95$ . Hence by linear iterated interpolation the values of k corresponding to the required e's are obtained. Tables A (1-15) and Tables B (1-15) give the e and k obtained for the various values of s. Tables C and D give the values of k for the e = .1 (.1) .9 and e = .95 for even and odd radial functions respectively of orders 1-15. These cut-off frequencies have been calculated for ellipses each of area  $\mathcal{T}$ , so that while the eccentricity varies, the area has been kept constant. When the cut-off frequency in an elliptic duct of a particular eccentricity e of cross section, but not of area  $\pi$ , is required, equation (3.8) can be used to obtain the result.

5.3 From Chapter IV, Article 4.5, it is known that  $Ce'_m$ ( $\xi, \gamma$ ) are proportional to  $Je'_m$  ( $\xi, \beta$ ) and  $Se'_{m+1}(\xi, \gamma)$ are proportional to  $Jo'_{m+1}(\xi, \beta)$ , where  $\beta = 4\gamma$ ; the constant of proportionality is a function of  $\gamma$ . These are called 'joining factors' and are tabulated in 'Tables Relating to Mathieu Functions'.<sup>22</sup> The value of  $\xi$  which

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be considered to a fixed number of term depending ofcourse on the order of the function, the value of s and the needed accuracy of the result.

The coefficients De and Do, correct to nine significant figures, for given values of s (at certain intervals) up to 100 have been tabulated <sup>22</sup> for functions of up to order 15.

5.31 A computer program subroutine (in Fortran IV) calculates the values (up to a required accuracy) of Bessel functions, up to a few orders less than 200 for the same argument.<sup>1,15</sup>

Let  $\mathcal{J}_n(x) = 0$  for a 'n' very large compared to the argument and let  $\mathcal{J}_{n-1}(x) = 10^{-70}$ 

With the help of the recurrence relation  $J_{n-1}(x) + J_{n+1}(x) = \frac{2\pi}{x}J_n(x)$ that is  $J_{n-1}(x) = (2\pi/x) J_n(x) - J_{n+1}(x)$ the values of Bessel functions with decreasing n are successively evaluated for the same argument x. Then the factor A, such that  $\frac{1}{A} = J_0(x) + 2J_2(x) + 2J_4(x) + \cdots$ 

is obtained and each value of  $J_n(x)$  obtained earlier is multiplied by A to give the required values of the Bessel functions of all orders up to a few orders less than n.

This method avoids the accumulation of rounding errors which occur when n > x and the recurrence relation is used with ascending n.

5.32 It now becomes possible to compute the values of  $\mathcal{J}_{e'm}$  (or  $\mathcal{J}_{o'm}$ ) for a given s and a given  $\sqrt{scosk}\xi(=\omega)$ . \* used with the kind permission of Dr. M.V. Lowson.

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makes  $Ce'_m$  vanish for a given value of q hence would not differ from that, which makes  $\overline{Je'}_m$  zero for the same q. Hence without any loss of generality the functions  $\overline{Je'_m(\overline{3}, \beta)}$ and  $\overline{Jo'_{m+1}(\overline{3}, \beta)}$  can be considered. Now  $\overline{Je}_{2n+p}(\overline{3}, \beta) = (-1)^n / \frac{\pi}{2} \sum_{h=0}^{\infty} (-1)^h De_{2h+p} \overline{J}_{2h+p}(\sqrt{3} \cosh \overline{\beta})$ p = 0 or 1 according as a function of period  $\pi i$  or  $2\pi i$ is being considered.

Due to uniform convergence (Article 4.12), we can differentiate  $Je_{2n+p}$ ,  $J_{O}_{2n+p}$  with respect to  $\xi$ , term by term. Hence  $Je'_{2n+p}$   $(\xi, \delta) = (-1)\sqrt{\frac{\pi\delta}{2}} \sinh \xi \frac{\delta}{\delta} \frac{\hbar}{h=0} Je_{2n+p} \frac{J(\delta \cosh \xi)}{2\hbar p}$ which can be written as <sup>29</sup>  $Je'_{2n+p}$   $(\xi, \delta) = (-1)^n \sqrt{\frac{\pi\delta}{2}} \sinh \xi \frac{\delta}{h=0} (-1)^n De_{2n+p} \frac{\chi}{h=0}$  $Je'_{2n+p-1} (\delta \cosh \xi) - J_{2n+p+1} (\delta \cosh \xi) (5.1)$ 

(from a recurrence relation for Bessel functions). Similarly  $Jo'_{2n+p}(\xi, \beta) = \frac{d}{d\xi} \left[ (-1)^{n} / \frac{\pi}{2} \tanh \xi \stackrel{\sim}{\underset{h=0}{\leq}} (-1)^{n} (2n+p) Do \int (45 \cosh \xi) \right]$   $= (-1)^{n} / \frac{\pi}{2} \tanh \xi \rho_{h} h \xi \stackrel{\sim}{\underset{h=0}{\leq}} (-1)^{n} (2n+p) Do \int (45 \cosh \xi) \right]$   $= (-1)^{n} / \frac{\pi}{2} \tan h \xi \rho_{h} h \xi \stackrel{\sim}{\underset{h=0}{\leq}} (-1)^{n} (2n+p) Do \int (45 \cosh \xi) \right]$   $+ (-1)^{n} / \frac{\pi}{2} \frac{1}{\cosh k^{2}} \stackrel{\sim}{\underset{h=0}{\leq}} (-1)^{n} (2n+p) Do \int (45 \cosh \xi) \right]$   $= \frac{Jo}{2n+p} + (-1)^{n} \sqrt{\frac{\pi}{2}} \tanh \xi \rho_{h} h \xi \rho_{h} h \xi \rho_{h} h \xi \rho_{h} h \xi \rho_{h} \rho_{h}$ 

It is of importance to note here that though in principle the series is infinite, due to the rapid decrease of the coefficients to zero, for a given s, the series need only

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A program evaluates the values of  $Je'_{m}(Jo'_{m})$  for values of w starting with  $\sqrt{3}$  (which means  $\omega = \sqrt{3} \cosh \xi = \sqrt{3}$ , or  $\cosh \xi = 1$  or  $\xi = 0$ ) (we know the value of  $Je'_{m}$  for  $\xi = 0$  is zero). The values of w increase by increments of 0.5 or 0.1 depending on the value of s and the order of the function. When the function changes sign from postive to negative, by chord iterative inverse interpolation <sup>17</sup> the value  $\omega_{o}$  of  $\omega$  which makes the function  $Je'_{m}(Jo'_{m})$  vanish is obtained.

Suppose Je'(i) for a value w (1) of w is positive and Je'(k) is negative for w (k). Then a better approximation to the zero of the function is obtained by the intersection of the line through ( $\omega(i)$ , Je'(i)) and ( $\omega(k)$ ,

Je'(k) ) with the X-axis (where the  $\omega$  is along the X-axis and Je' along the Y-axis)

The equation of the line is given by

 $Je' - Je'(k) = \frac{Je'(i) - Je'(k)}{\omega(i) - \omega(k)} \left[ \omega - \omega(k) \right]$ 

So that  $\omega(k+i) = \omega(k) - Je'(k) \frac{\omega(i) - \omega(k)}{Je'(i) - Je'(k)}$ =  $\frac{\omega(k) Je'(i) - \omega(i) Je'(k)}{Je'(i) - Je'(k)}$ 

gives a nearer value to the zero. We can find Je'(k+i) for this  $\omega \cdot (k+i)$  and apply the above formula again replacing k by k+i. This process can be continued until the required accuracy is obtained. The program provides for 18 such iterations and the result obtained is accurate to 8 significant figures. If even after 18 iterations the accuracy required is not obtained, it shows that  $\omega$  has been incremented excessively. Hence a smaller increment to  $\omega$  is to be given.

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With this value of  $\omega_o$ , e and k are found in a straight-forward manner from equations (3.10) and (3.11). Since the values of  $\omega_o$  are correct to eight significant figures and the values of  $\sqrt{3}$  are correct to eleven significant figures (due to computer limitations) the values of e are correct to eight significant figures at least and the values of k have an accuracy of seven significant figures. All this has been said on the assumption that the values of the function  $\overline{Je}'_m$  ( $\overline{Jo}'_m$ ) are correct to eight significant figures.

With the help of expansions (4.39), the values of function  $\overline{Je}_m$  ( $\overline{Jo}'_m$ ) were calculated and from these the values of  $\omega_o$ , e and k were obtained as mentioned above. It was found that accuracy of eight significant figures has been maintained for  $\omega_o$  so that e and k are respectively accurate as mentioned above.

5.4 The values of e, obtained in the previous article, are at irregular intervals. They are, however, in an ascending order of magnitude. To obtain the values of k for e = .1 (.1) .9 and e = .95, the method of linear iterated interpolation is applied.<sup>24</sup>

Let  $\chi_j$  be the values of a variable and let values  $f(\chi_i)$  of a function f be known for these  $\chi_i$ . Let x be an interior point (between the smallest and the largest of  $\chi_i$ ) and we are to find the value of the function for this x. We calculate, successively, the functions  $f_2(\chi_i, \chi_{i+1})$ ,  $f_3(\chi_i, \chi_{i+1}, \chi_{i+2})$ , .....

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where  $f_{2}(x_{i}, x_{i+1}) = \frac{(x_{i}-x)f(x_{i+1}) - (x_{i+1}-x)f(x_{i})}{(x_{i}-x) - (x_{i+1}-x)}$   $f_{3}(x_{i}, x_{i+1}, x_{i+2}) = \frac{(x_{i}-x)f(x_{i+1})x_{i+2} - (x_{i+2}-x)f(x_{i}, x_{i+1})}{(x_{i}-x) - (x_{i+2}-x)}$ etc., until we obtain the final convergent. For example, if i=7, we have to obtain  $f_{7}(x_{1}, x_{2}, x_{3}, x_{4}, x_{5}, x_{6}, x_{7})$ . The final convergent gives the value of f(x) at x. If the  $x_{i} - x$  are so arranged that  $|x_{i} - x|$  are in an ascending order, the convergence is rapid and a more accurate result is obtained.

The program from which the values of k for particular values of e are obtained, incorporates the above and the results so obtained are given in Tables C and D. These values are accurate to six significant figures. The values of k corresponding to e = 0, (which is a circle)

were obtained from Olver.<sup>23</sup>

5.5 The method described above was followed and the values of the cut-off frequencies for ellipses of the required eccentricities were obtained.<sup>16</sup> However, there were two main hurdles to be overcome.

(1) For higher values of e, but smaller orders of the function, the above program did not converge so fast so that the results obtained were not sufficiently accurate.

(2) For large orders of the function, the cut-off frequencies could not be found, as values of coefficients for & larger than 100 were needed in this case and these are not tabulated in National Bureau of Standards.<sup>22</sup>

In the first case, the values k decreased more rapidly as e increased. Hence it was necessary that more values of k be calculated nearer the required eccentricities.

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Hence for larger values of s, smaller increments in s were to be considered. The characteristic values  $be_{\lambda}$ ,  $bo_{\lambda} (a_{\lambda} = be_{\lambda} - b/2 and b_{\lambda} = bo_{\lambda} - b/2)^{*}$  are tabulated at smaller intervals of s in National Bureau of Standards.<sup>22</sup> If the coefficients De (Do) could be generated from these characteristic values, then the functions could be evaluated by the method described above and then the values of  $\omega_{o}$ , e, and k computed.

In the second case, the characteristic values for s larger than 100 have been tabulated in Blanch and Rhodes 5. Here the tabulation has been done for values of t and the characteristic numbers  $Be_{n}(t)$  and  $Bo_{n}(t)$  are given, where

$$t = 1/5$$

\* See expansions 4.6

$$Be_{n}(t) = be_{n}(s) - \nu_{1}\sqrt{s}$$
, where  $\nu_{1} = 2n+1$ 

and

 $Bo_{n}(t) = Jo_{n}(s) - \nu_{2} i \delta$ , where  $\nu_{2} = 2n - 1$ 

The range of t is  $0 \le t \le \cdot 1$  so that s ranges from  $\ll$ to 100. The characteristic values  $a_h$  and  $b_h$  for a given s can be obtained from  $a_h = b e_h(s) - s/2$  and  $b_h = b \phi_h(s) - s/2$ , which are obtained from Ber and Bor. Once again, when the characteristic values are known, the problem just reduces to one of generating the coefficients  $\mathcal{D}e_m(\vec{D}o_m)$ .

5.6 The method of obtaining the characteristic values a (or b) for the Mathieu's equation for a given value of  $q_{(=4,s)}$  and then generating the coefficients from these values is given in Ince, <sup>12</sup> Goldstein, <sup>9</sup> McLachlan.<sup>19</sup> A detailed method by which the coefficients of expansion can

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be found, once the characteristic values are known is given in Blanch 4, and it has been found most useful, when the coefficients have to be found for low order functions with not too high  $q_{i}$ and for high order functions with large  $q_{\prime}$  . The method is discussed in detail below.

Substituting the expansions (4.3) in the Mathieu's equation (4.1) and equating the coefficients of  $cosm\eta$ (or sin  $m\eta$  ) to zero, the following relations are obtained:

$$A_2 = v_0 A_0, v_2 A_2 - 2A_0 = A_4; A_3 = A_1(v_1 - 1)$$
 (5.3)

$$B_0 = 0$$
,  $B_4 = v_2 B_2$ ;  $B_3 = B_1 (v_1 + 1)$  (5.4)

and  

$$A_{m-2} + A_{m+2} = v_m A_m$$
or  

$$B_{m-2} + B_{m+2} = v_m B_m$$
(5.5)

where  $v_m = \frac{a - m^2}{q}$  or  $\frac{b - m^2}{q}$ (5.6)

a (or b) being the characteristic value of the function.

If 
$$G_m = \frac{A_m}{A_{m-2}} \delta l \frac{B_m}{B_{m-2}}$$
, and  $H_m = \frac{l}{G_m}$ 

then the above equations reduce to

$$G_{1_{2}} = v_{0}, G_{1_{4}} = v_{2} - \frac{2}{G_{2}} = v_{2} - 2H_{2} = \frac{1}{v_{1_{4}} - G_{2}},$$
  
for  $ce_{2n}$  (5.7)

$$G_{1_3} = v_1 - 1 = \frac{1}{v_3 - C_{7_5}}$$
 for  $Ce_{2n+1}$  (5.8)  
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$$H_2 = 0, G_1 = v_2 = \frac{1}{v_1 - G_6}$$
 for  $se_{2n+1}$  (5.9)

$$G_3 = v_1 + 1 = \frac{1}{v_3 - G_5}$$
 for  $Se_{2n+2}$  (5.10)

And in general  $G_m = \frac{1}{v_m - G_{m+2}}$ ,  $m \ge 3$  (5.11)

 $G_{m} = v_{m-2} - \frac{1}{G_{m-2}} = v_{m-2} - H_{m-2}, m \ge 5$  (5.12)

Since the series (4.3) are absolutely convergent for given values of q, there is a number M for each series such that

Let  $m_i$  be one such value. Then  $\mathcal{V}_{m_i}^+$  has a very large numerical value.

Since

and

$$|G_{m_1}| = |v_{m_1-2} - H_{m_1-2}| < 1$$

the magnitude of  $H_{m_i-2}$  must be of the same order as that of  $\mathcal{V}_{m_i-2}$  and also it must have the same sign as  $\mathcal{V}_{m_i-2}$ . This means there will be a loss of considerable number of significant figures when  $H_{m_i-2}$  is subtracted from  $\mathcal{V}_{m_i-2}^{-}$ . No doubt, the values of the coefficients do decrease rapidly in this region; however, the loss of accuracy of the result, if this formula were used is more and hence it is not possible to generate all the  $G_m$  from this formula. Once the  $G_2$ ,  $G_4$ , ..... (or  $G_1$ ,  $G_3$ , ....) have been evaluated, the coefficients  $AD_0$ ,  $AD_2$ , ...... (or  $AD_1$ ,  $AD_3$ , ....), can be found, A being an arbitrary

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constant. (Without any loss of generality, we use D\_m to represent coefficient  $A_m$  or  $B_m$ , since for a characteristic value 'a' or 'b' gives rise to only one periodic solution, when  $\psi$  is not zero and no confusion arises as to the type of coefficients considered.)

Of the four type of solutions considered, only the first (even function with period  $\pi$  ) is a bit compli-The rest can be obtained without much difficulty. cated. So we shall consider even functions of period TT

Initially the coefficients D<sub>m</sub> are all positive and they increase up to a largest coefficient, say, D, and then they start decreasing so that

$$D_{\nu+n} < D_{\nu+n-2}$$
,  $n \ge 2$ 

This means

 $G_{n_{2}+m} < 1$ ,  $Y_{n>0}$  $G_{n_{2}-m} > 1$ ,  $Y_{n>0}$ 

and

Since the coefficients decrease to zero, let us suppose that the series is terminated after a certain number of terms for the required accuracy. From the order of the function and the value of q , it is possible to determine this number without much difficulty. Let  $D_w$  be the last term of the series.

We first compute the values of  $v_o, v_2, \ldots, v_{\omega}$ from equation (5.6) to the required number of significant figures, which is the number of significant figures needed in the largest coefficient  $D_m$ .

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After this, the quantities  $G_2$ ,  $H_2$ ,  $G_4$ ,  $H_4$ , ....,  $G_y$ ,  $H_y$  are evaluated, where each  $G_m$  is computed from equations (5.7) or (5.12) and the  $H_m$  are obtained as reciprocals of  $G_m$ . The computation continues until the  $G_m$  are numerically greater than unity,  $G_y$  being the last of these. The computation in this direction is now stopped after  $H_y$  has been found. This is known as the 'forward' process.

Since  $D_w$  is the last term of the series, it will be very near zero, and we can write

 $G_{W} \simeq \frac{1}{V_{W}}$  (Actually  $G_{W} = \frac{1}{V_{W} - G_{W+2}}$ , but since  $V_{W}$  is very large and  $G_{W+2}$  negligible, we get the result)

From  $G_w$ , the values of  $H_w - 2$ ,  $H_w - 2$ , ....  $H_v$  are obtained from equation (5.12), as that equation gives

$$H_{m-2} = v_m - G_m$$

The  $G_m$  are now obtained as the reciprocals of  $H_m$ .  $G_{W-2} = I \int H_{W-2}$  and so on. In these calculations the number of significant figures obtained increases in accuracy at each step until a maximum accuracy is reached. The last value obtained in this process is  $H_{\gamma}$ . This is known as the 'backward' process.

The value of  $H_{\mathcal{V}}$  obtained here is compared with the value of  $H_{\mathcal{V}}$  obtained earlier. If the agreement is satisfactory (if, for example, we desire to have the largest coefficient to nine significant figures, the two values of  $H_{\mathcal{V}}$  should agree to that extent), The coeffi-

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cients can now be determined.

The coefficients so determined can then be normalised in the manner required.

We now write  $D_{y} = 1$ .

The remaining coefficients  $D_m$  are obtained by the relationships

$$\begin{split} \mathcal{D}_{\mathcal{V}+2} &= G_{\mathcal{V}+2} \ , \ \mathcal{D}_{\mathcal{V}+4} &= \mathcal{D}_{\mathcal{V}+2} \ G_{\mathcal{V}+4} \ , \ \cdots & \mathcal{D}_{\mathcal{W}} = \mathcal{D}_{\mathcal{W}-2} \ G_{\mathcal{W}} \\ \mathcal{D}_{\mathcal{V}-2} &= H_{\mathcal{V}} \ , \ \mathcal{D}_{\mathcal{V}-4} = \mathcal{D}_{\mathcal{V}-2} \ H_{\mathcal{V}-2} \ , \ \cdots \ , \ \mathcal{D}_{o} = \mathcal{D}_{2} H_{2} \ , \ \mathcal{V} \geq 2 \\ \text{If } \mathcal{V} = 0 \ , \ \mathcal{D}_{o} = I \ , \ \ \mathcal{D}_{2} = G_{2} \ , \text{ and so on.} \\ \text{To obtain the coefficients } \mathcal{D}_{e_{2}m} \ , \\ \text{Let} \quad A = \sum_{\substack{\mathcal{W} \\ A = 0}}^{\mathcal{W}} \mathcal{D}_{\mathcal{R}} = I \\ \text{Then each } \mathcal{D}_{e_{\mathcal{R}}} = \mathcal{D}_{\mathcal{R}} \ / A \end{split}$$

Methods have to be found to increase the accuracy, when the values of H $_{\mathcal{V}}$ , found by the two processes do not agree to the required number of significant figures. The error in the ratios G<sub>m</sub> is due to

(1) rounding off errors in the various calculations, which could be avoided by taking sufficient number of significant figures

and

(2) error in the value of the characteristic value a. Suppose  $\alpha = \overline{\alpha} + \lambda$ , where a is the real value,

 $\overline{a}$  is the assumed value and  $\lambda$  is the error.

Let the ratios  $G_m$  and  $H_m$  evaluated from the 'forward process' be denoted by  $G_{m,i}$  and  $H_{m,i}$  respectively and their errors from the actual value be  $\in_{m,i}$  and  $\gamma_{m,i}$  respectively.

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Hence

 $E_{m,1} = G_m - G_{m,1}$  and  $\eta_{m,1} = H_m - H_{m,1}$ 

Since

$$G_2 = \frac{\alpha}{q}$$
,  $E_{2,1} = \frac{\lambda}{q}$ 

Again since

$$H_{2} = 1 / (G_{2,1} + E_{2,1})$$

 $\mathcal{J}_{2,1} \simeq \mathcal{E}_{2,1} \mathcal{H}_{2,1} \simeq -\frac{\lambda}{q} \mathcal{H}_{2}^{\perp}$  neglecting powers of  $\lambda | q / q$ greater than 1 and replacing  $\mathcal{H}_{2,1}$  by  $\mathcal{H}_{2}$ . From the methods used to obtain the ratios  $G_{\rm m}$  and  $\mathcal{H}_{\rm m}$  in the forward process, we obtain

$$\begin{aligned} \varepsilon_{2,1} &= \frac{\lambda}{q} \\ \varepsilon_{1,1} &= \frac{\lambda}{q} (i + 2H_2^2) , \\ \eta_{1,1} &= -\frac{\lambda}{q} (H_1^2 + 2H_1^2 H_2^2) \\ \varepsilon_{m,1} &= -\frac{\lambda}{q} (i + H_{m-2}^2 + H_{m-2}^2 H_{m-4}^2 + \cdots + 2H_{m-2}^2 H_{m-4}^2 \cdots H_2^2) \\ &= m_{n-2} + m_{m-2} + m_{m-2} + m_{m-4} + \cdots + 2H_{m-2} + m_{m-4}^2 \\ &= m_{n-2} + m_{m-2} + m_{m-2} + m_{m-4} + \cdots + m_{m-2} + m_{m-4} + \cdots + m_{m-4} + m_{m$$

$$\begin{array}{l} \gamma_{m,1} = -\frac{\lambda}{9} H_{m}^{2} \epsilon_{m,1} \\ \text{If} \\ R_{m,1} = H_{m}^{2} + H_{m}^{2} H_{m-2}^{2} + \cdots + 2H_{m}^{2} H_{m-2}^{2} \cdots H_{2}^{2} \\ R_{2,1} = H_{2}^{2} , R_{0,1} = 0. \end{array}$$

it at once follows that

$$\begin{aligned} & \epsilon_{m,1} = \frac{\lambda}{q} (1 + R_{m-2,1}) & m \ge 6 \\ & \epsilon_{h,1} = \frac{\lambda}{q} (1 + 2R_{2,1}) \\ & \epsilon_{2,1} = \frac{\lambda}{q} \\ & \gamma_{m,1} = -\frac{\lambda}{q} R_{m,1} \end{aligned}$$
 (5.13)

 $H_{m,2}$  and  $G_{m,2}$  denote the values of  $H_m$ ,  $G_m$  evalu-Let ated from the 'backward process' and let  $\eta_{m,2}$ ,  $\epsilon_{m,2}$ denote the respective errors from the real values  ${\rm H}_{\rm m}$  and  ${\rm G}_{\rm m}$  $\eta_{m,2} = H_m - H_{m,2}$  and  $\epsilon_{m,2} = G_m - G_{m,2}$ so that  $G_{\mu\nu} \simeq 1/\nu_{i\nu}$ If  $G_{w}$  is the last ratio evaluated Hence  $\epsilon_{\omega,2} = -\frac{\lambda}{q} G_{\omega}^{L}$ With the help of the method used in generating the ratios  $G_m$  and  $H_m$  in the 'backward process' we obtain  $\eta_{\omega-2,2} = \frac{\lambda}{q} \left( 1 + G_{\omega}^{2} \right), \quad \epsilon_{\omega-2,2} = -\frac{\lambda}{q} \left( G_{\omega-2}^{2} + G_{\omega-2}^{2} - G_{\omega}^{2} \right)$  $\eta_{m,2} = \frac{\lambda}{q} \left( 1 + G_{m+2}^{2} + G_{m+2}^{2} - G_{m+4}^{2} + G_{m+4}^{2} - G_{m+2}^{2} - G_{m+2}^{2} - G_{m+4}^{2} - G_{$  $\eta_{2,2} = \frac{\lambda}{q} \cdot \frac{i}{2} \left( 1 + G_{4}^{2} + G_{4}^{2} G_{6}^{2} + \cdots + G_{4}^{2} G_{4}^{2} \cdots + G_{4}^{2} G_{4}^{2} \cdots - G_{\omega}^{2} \right)$  $E_{m,2} = -G_{m}^{2}\eta_{m,2}$  $\frac{1}{R_{m+2}} = 1 + G_{m+2}^{2} + G_{m+2}^{2} - G_{m+2}^{2} + G_{m+2}^{2} - G_{m+2}^$  $R_{2,2} = \frac{1}{2} \left( 1 + G_{1}^{2} + G_{1}^{2} G_{1}^{2} + \dots + G_{n}^{2} G_{n}^{2} - \dots + G_{n}$  $R_{0,0} = 2 + G_2^2 + G_2^2 G_1^2 + \cdots + G_2^2 G_2^2 G_1^2 \cdots G_{10}^2$ 

it follows that

$$\eta_{m,2} = \frac{2}{9} R_{m,2}, m \ge 2$$
 (5.15)

$$E_{m,2} = -\frac{\lambda}{2} \left( \hat{R}_{m-2,2} - 1 \right), m \ge 6$$
 (5.16)

$$e_{4,2} = -\frac{2}{7} \left( 2R_{2,2} - 1 \right)$$

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If H  $_{\mathcal{V}}$  is the real value,

- $H_{2} = H_{2}, I = \frac{\lambda}{2} R_{2}, I$  (from equation (5.13))
- $H_{\mathcal{Y}} = H_{\mathcal{Y}}, 2 + \frac{\lambda}{q} R_{\mathcal{Y}}, 2$  (from equation (5.15))

Hence 
$$\frac{\lambda}{9} = (H_{2,1} - H_{2,2}) / (R_{2,1} + R_{2,2})$$

and  $H_{\mathcal{Y}} = (R_{\mathcal{Y},2} H_{\mathcal{Y},1} + R_{\mathcal{Y},1} H_{\mathcal{Y},2}) / (R_{\mathcal{Y},1} + R_{\mathcal{Y},2})$ 

Since the ratios  $G_m$  and  $H_m$  are so obtained that  $G_m \ge 1$ for  $m \le \omega$ , and  $G_m \le 1$  for  $m > \omega$ , from the expressions for  $R_{\omega,1}$  and  $R_{\omega,2}$  it is obvious that  $R_{\omega,1}$  is generally < 1 and  $R_{\omega,2} > 1$  when  $\omega > 2$ . Hence, generally  $H_{\omega,1}$ will be nearer  $H_{\omega}$  than  $H_{\omega,2}$ . With this corrected value of  $H_{\omega}$ , we now proceed to correct a few of the ratios  $G_m$ ,  $H_m$ , m having values near  $\omega$ . (As the coefficients rapidly reduce in magnitude when m is much greater than  $\omega$ , only a few of the ratios  $H_m$ ,  $G_m$ , m near  $\omega$ , need correction).

Evaluate  $H_m = H_{m,1} - \frac{\lambda}{q} R_{m,1}$  (m<x) (as  $H_m$  generates the value  $G_m$ , only  $H_m$  need be corrected) and

$$G_{m} = G_{m,2} - \frac{\lambda}{q} (R_{m+2,2} - 1) (m > \lambda)$$

(as  $G_m$  generates  $H_m$ , only  $G_m$ , for a few values of m need be corrected)

After these corrections, it can be checked whether the  $H_{\mathcal{V}}$  obtained above agrees with  $H_{\mathcal{V},l}$  to the required number of significant figures (which, has been found to be

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true).

The coefficients  ${\tt D}_{\tt m}$  are computed and the values of  ${\tt D}_{\tt m}$  can be checked by the formula

 $v_{m-2} D_{m-2} = D_{m-4} + D_m \qquad m \ge 5^{-1}$   $v_2 D_2 = D_4 + 2 D_0$ 

which gives the accuracy of the values found. Now the  $D_m$  could be normalised to obtain the coefficients  $\mathcal{D}e_m$ 

The above method could be applied to all the four periodic functions with the appropriate initial relations given by equations (5.7) to (5.10).

Once the coefficients are found the required values are obtained by a method described earlier in this chapter.

## CONCLUSION.

The cut-off frequencies for high order circumferential modes have been calculated for various eccentricities of the elliptic duct section.

The cut-off frequencies for even functions decrease with increasing eccentricity as was expected. For odd functions, though for the lowest two orders the eigen frequencies increase with eccentricity, it is of interest to note that the third order eigen frequencies are oscillatory as the eccentricity increases. For higher order odd functions, the eigen frequencies decrease in as much as, for high orders, they assume the same values as those for even functions. As a matter of fact, we find that deforming a circular pipe into an elliptic one of sufficiently large eccentricity produces only a small reduction in the cutoff frequency, provided the area of the pipe section is kept invariable.

DADAMETER S         ECCENTRICITY         EIGENEREQUENCY           0.00         0.000000         1.8411838           0.20         0.2420034         1.8150734           0.40         0.3426603         1.7889420           0.50         0.38287512         1.7750756           0.60         0.4101503         1.608477           0.30         0.4533714         1.775333           1.00         0.5974728         1.4098831           1.20         0.5904558         1.666634           1.40         0.63696520         1.81994           1.60         0.6538319         1.612972           1.50         0.6538119         1.512972           2.00         0.7539214         1.59271072           2.00         0.7539214         1.590681           2.20         0.7641422         1.4560193           2.40         0.7539209         1.6091573           2.50         0.64672419         1.3693462           2.60         0.7623509         1.6091573           2.50         0.6472419         1.3692462           2.80         0.9247283         1.60193           2.20         0.97478536         1.047208           3.50 <t< th=""><th>TABLE A OR</th><th>DER 1</th><th></th><th></th></t<>	TABLE A OR	DER 1		
A. A. C. D. C.	DARAMETER C	COCCUTOIOTY	EICENTREOUCHAN	
0.00       0.00000       1.6411838         0.20       0.22260034       1.6456734         0.50       7.3227512       1.750756         0.50       7.3227512       1.750756         0.60       0.4191505       1.7698427         0.30       0.40338714       1.7312503         1.20       0.5904258.8       1.6696834         1.20       0.5904258.8       1.6696562         1.40       0.63696520       1.6309672         1.50       0.65374228       1.6096831         1.40       0.65696520       1.6309672         1.50       0.65383119       1.414994         1.60       0.63003176       1.5927107         1.40       0.65383119       1.414994         1.60       0.63003176       1.5912972         2.00       0.72641472       1.460193         2.20       0.72641472       1.460193         2.40       0.62393039       1.6011573         2.50       0.64472419       1.362262         2.80       0.69206300       1.8611848         2.00       0.92197298       1.4690700         3.50       0.92208932       0.6681257         3.50       0.92208932	PAPADELER 5	ELUCHIKICIII	CIGENEREADENCY	·
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.00	0.00000000	1,8411838	
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0         0         1         1         1         7         0 <th0< th=""> <th0< th=""> <th0< th=""> <th0< th=""></th0<></th0<></th0<></th0<>	0.40	0.34260693	1,7889420	
0.85 0.85 0.55074928 1.20 0.55049543 1.40 0.55049543 1.60 0.654654 1.50 0.65488119 1.60 0.65488119 1.60 0.7530214 1.512972 2.00 0.75321348 1.5060681 2.20 0.72411472 1.4561193 2.40 0.724219 1.360362 2.60 0.76472419 1.360262 2.80 0.72412419 1.360262 2.80 0.72412419 1.360262 2.80 0.72412419 1.360262 2.80 0.72412419 1.360262 2.80 0.72412419 1.360262 2.80 0.72412419 1.360262 2.80 0.72412419 1.360262 2.80 0.72412419 1.360262 2.80 0.72412419 1.360262 2.80 0.72412419 1.360262 2.80 0.9210728536 1.600700 3.20 0.9210728536 1.600700 3.20 0.92208932 0.66631237 1.600700 1.20127 1.20127 1.2	0.20	0.41915605	1.7730738	····
1,00       0,5974928       1,699831         1,20       0,59049588       1,665634         1,20       0,63696520       1,6399672         1,50       0,65083119       1,6121994         1,60       0,6003176       1,55227107         1,60       0,72330214       1,5512772         2,00       0,75341848       1,500661         2,20       0,76411472       1,4601373         2,43       0,8235039       1,4601373         2,60       0,26472419       1,3693482         2,60       0,26472419       1,3693482         2,60       0,26472419       1,3693482         2,60       0,26472419       1,3693482         2,60       0,26472419       1,3693482         2,60       0,26472419       1,3693482         2,60       0,27032630       1,2611360         3,20       0,95178536       1,690700         3,20       0,95178536       0,6631237         3,50       0,79208932       0,6631237	0.80	0.48338714	1.7312303	• • • • • • • •
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1.00	0.53974928	1,6998831	
1.40       0.0309020       1.6309764         1.50       0.63083119       1.6121994         1.60       0.64003176       1.5927107         1.60       0.7230214       1.5912972         2.00       0.75321848       1.5060681         2.20       0.77441472       1.4601973         2.60       0.82323939       1.4011573         2.60       0.82472419       1.3693482         2.60       0.84472419       1.3693482         2.60       0.86483194       1.3693482         2.60       0.86483194       1.3693482         2.60       0.86483194       1.3693482         2.60       0.86483194       1.3693482         2.60       0.89216830       1.2611360         3.00       0.97167836       1.600700         3.20       0.97365355       0.8551235         3.50       0.99208932       0.6631237	1.20	0.59049548	1.6665634	
1.60       0.03176       1.5227107         1.60       0.72030214       1.552272         2.00       0.7521348       1.5600681         2.20       0.7241142       1.4561193         2.40       0.7241142       1.4561193         2.60       0.7241142       1.4561193         2.60       0.7241142       1.3602262         2.60       0.86472419       1.3632262         2.60       0.36483104       1.3362262         2.60       0.36483104       1.3600         3.00       0.92197203       1.460700         3.20       0.95178536       0.6851235         3.40       0.97236535       0.6631237	1.40	0.03690320	1.6507674	
1.20         0.72030214         1.5512972           2.00         0.75321848         1.5000681           2.20         0.79411472         1.4561193           2.40         0.8232039         1.4001573           2.50         0.8472419         1.559262           2.60         0.7237282         1.356262           2.60         0.8608192         1.356262           2.60         0.86083194         1.356262           2.60         0.78072630         1.2611360           3.00         0.92197298         1.469700           3.20         0.92197298         1.469700           3.20         0.92197298         0.6631257           3.50         0.99268932         0.6631257	1.60	0.03880177	1-5927107	
2.00 0.75321548 1.5000681 2.20 0.7641472 1.4561193 2.40 0.82325039 1.4001573 2.50 0.84472419 1.35693482 2.60 0.36483194 1.3562262 2.30 0.92107293 1.1690700 3.20 0.95175536 1.0647205 3.40 0.973565 0.8551235 3.50 0.99208932 0.6681237	1.80	0.72030214	1.5512972	
2.20       0.72411472       1.4561193         2.40       0.82425039       1.4001573         2.50       0.84472419       1.3693482         2.60       0.86083194       1.3362262         2.30       0.9202630       1.26113560         3.00       0.9202630       1.26113560         3.00       0.9202630       1.4690700         3.20       0.95178536       1.0472905         3.40       0.97365305       0.8551235         3.50       0.99208932       0.6631237	2.00	0.75321348	1.5060681	· · · · · · · · · · · · · · · · · · ·
2,40       0.8235039       1.4001575         2,50       0.82472419       1.3693482         2,60       0.76083194       1.3362262         2,80       0.92107298       1.1600700         3,20       0.95078536       1.0472905         3,40       0.97356305       0.8551235         3,50       0.99208932       0.66631237	5.50	0.79411472	1.4561193	
2.50       0.636472417       1.3562262         2.60       0.366483194       1.3562262         2.80       6.3922630       1.2611360         3.20       0.92197293       1.1690700         3.20       0.95078536       1.0472905         3.40       0.97356305       0.8551235         3.50       0.99208932       0.6681237	2.40	0.82325039	1,40015/3	
2:30       0:30202630       1:2611360         3:00       0.92107293       1:1690700         3:20       1:95178536       1:0472905         3:40       0.97356305       0:8551235         3:50       0.79208932       0:6631237	2.20	0,04472419	1,3073402	
3.00       0.92197298       1.1690700         3.20       0.95178536       1.0472905         3.40       0.97365305       0.8551235         3.50       0.99208932       0.66831257	2.80	0.89202630	1.2611360	
3, 20       0, 95 078536       1, 0672905         3, 40       0, 97356305       0, 8551235         3, 50       0, 99208932       0, 6631237	3.00	0.92197298	1.1690700	
	3.20	0.95078536	1.0472905	
	3.40	0.97356305	0.8551235	• •
	5:20	0.99200932	V.6631627	

TABLE A DRDE	R 2	
PARAMETER	ECCENTRICITY	EIGENFREQUENCY
0.00	0.0000000	3.0542369
0.20	0.14565701	3.0539037
0.40	0.20495449	3.0529044
0.00	0.24980620	3,0512406
0.00	10,28711696	5.0489144 7.0750380
1.00	0.34359671	3.0422881
-1 40	0.37499295	3.0379964
1.60	0.39931845	3.0330588
1.80	0.42195555	3,0274805
2.00	0.44313412	3.0212673
2.40	0.68221761	3.0069580
2.00	0.30031972	2 0001762
	0.27782204	2 9808661
3.40	0.56561791	2,9604364
3.60	0.58050941	2.9493195
3.80	0.59493085	2.9376028
4.00	0.60892157	2,9252859
4.20	0.62251533	2,9123674
4.40	0.03574568	6,8988442
<u> </u>	0,00120301	2,8699634
5 40	0 69721609	2 8219347
5.60	0.70870939	2,8046231
5.80	0.71997108	2.7866341
6.00	0.73101349	2.7679483
6.60	0.76293233	2.7074656
6.80	0.7/320043	2,6857302
2 20	0.70329049	2,0031473
7 40	<u> </u>	2 6152594
7.62	0,81262237	2.5898481
8.00	0.83143217	2,5357682
0.00	0.87615681	2.3772493
0.40	0.80321267	2.3016476
9.50	0.89740765	2,2813449
9.00	0.90157582	2.2604100
10.00	0.70983310	<u> </u>
10.20	0 \$2604152	2 118762
10.40	0.93309774	2 0638329
19.50	0.93793942	2.0345004
16.60	0.94185854	2.0037481
10.80	0.94962620	1.9373059
11.00	0.95730236	1.8627783
	0.96489059	1.7775484
11.20		

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PAPAMETER S	ECCENTRICITY	EIGENFREQUENCY
	0.0000000	4,2011889
0.20	0.10614918	4.2011487
0.40	0.14969727	4.2010261
0.00	0.18285122	4.2008184
1 00	0 23473776	4 2001355
1.20	0.25644327	4.1996545
1.40	0.27624330	4.1990765
1.60	0.29452641	4,1983985
2 00	0.3755238	4.1970173
2.20	0.34264447	4,1957340
2.40	0.35695552	4, 19,46253
2.60	0.37057961	4,1934013
3.00	0.40802928	<u>4,1905940</u> <u>4,190556</u>
3, 49	0.41955150	4.1872886
	0.44139583	4,1834582
3.80	0.43066229	4.1854405
4.00	0.45173148	4,1813304
<u> </u>	0.48109551	4.1760739
4.80	0.49032113	4.1714220
5.00	0.49930304	4.1685689
5.20	0.50805621	4,1655578
<u> </u>	0.21657428	4.1623603
7,00	0.57845485	4.1309375
7.20	0,58551256	4.1262002
7.40	0.59244388	4,1212744
7.60	0.59925460 A 60505014	4,1161572
00.8	0 61253564	4.1053378
8.20	0.61901582	4.0996302
10.40	0.63446531	4.0229262
10.60	0.63996891	4,0146196
11 00	0 70078799	3 0973023
11.20	0.70610818	3,9882859
11.40	0.71137143	3.9790272
11.60	0.71657957	3,9695232
14.40	0.73009683	5,805/513
14.60	0.79361147	3.7811717
15.00	0.79309150	3,7669039
15.20	0.80253769	3.7523082
15.40 4r X0	0.00693074	5,73/57/5
10,20	0.88526328	3.3755673
10.40	0.38912529	3.3512839
19.60	0.89296384	3.3263074
10.80	0.89677921	3.3006012
20.00	0.79057168	3.2741223
21.00	0.91919953	3.1284798
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	PARAMETER S	ECCENTRICITY	EIGENFREQUENCY	······································
	21.50	0.92831063	3,0456770	
	22.00	0,93729099	2,9543919	· · · · · · · · · · · ·
. <b>.</b>	23 00	0.94614365	2.8525727	
	23.50	0.96347671	2.6037041	· · · · · · · · · · · · · · · · · · ·
	24.00	0.97196214	2.4440897	
······································	24.50	0.98032987	2.2430914	
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د معادد می اور اور معاملی می اور او این معاملی می اور	المراجع والمراجع العام العام العام والعراج		و . د میشد از با مواری میشد کار به در مادی مشید ا	معمود والمستريد المراجع
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· · · · · · · · · · · · · · · · · · ·	TABLE A GRDE	R 4	
	PARANETER S	ECCENTRICITY	LIGENEREQUENCY
•• • •• •	0.00	0.0000000	5.3175531
	0,50	0.13239212	5,3174442
······································	1.00	0.18641619	5,3171171
· ····································	1,50	0.22732803	5.3165708
• • •	2.00	0.26137446	5.3158037
	2.50	0,29093854	5.3148136
	3.00	0.51742494	> 3135975
	5.20	0.34143360	2.3161360
···· ···	4.00	0.30330447 0.38308262	5 3085551
······	5 00	0.37370202	5 3063934
·	5.50	0.42110101	5.3039815
• • • • • • • • • • • • • • • • • • •	6.00	0.43808285	5.3013128
	6.50	0.46949707	572951743
	7.50	0.48410822	5,2916879
	8.00	0.49308405	5.2879112
	8.50	0.51148282	5.2838342
	¢.00	0.52435472	5 2794464
		0,54868738	2,2696935
	11.00	0.2/15/602	2.2202527 5.2626754
	12 00	<u> </u>	5 2750283
د سب ، الدفة الد	13 00	0.61267989	5 2316972
	13.50	0.62228718	5,2239426
	14.00	0.63164282	5.2157409
	16.00	0.66584223	5 1781307
	17.00	0.68328426	5.1562008
•	17.50	0.69125338	5 1443916
	19.00	0.69906344	5 1319948
	18.50	0.70073055	5.1189916
	19.00		5 001082
	2/ 00	0.72338430	2.0910804 & 0301036
·····	24.50	0 73979345	4 9083079
	25.00	0.79612707	4,8855310
····· ··· ··· ···	25.50	0.80238882	4,8618351
	24.00	0.80358165	4.8371908
	26.50	0.81470828	4,8115668
	27.00	0.82077120	4.7849297
	32.50	0.88380106	4.4121113
	33,00	0.83923469	4.3693114
	33.50	0.89462334	4,3240304
· · · ·	34.00	0.07496776	4.27(7330 4.2200/77
	35.00	0.91052645	<u>4.6778553</u>
• •	35,50	0.91574187	4 1240917
	37.00	0.93113831	3,9448857
•• • •	37.50	0.93618859	3,8780535
	38.00	0.94119853	3.8069319
	38.50	0.94616845	3.7309226
-	30.00	0.95109865	3.6492764
	39.50	0.95598939	3,5610367
	48.00	0.96084092	5,4649520

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 	TABLE A ORDE	<u> </u>		·····
	PARAMETER S	ECCENTRICITY	EIGENFREQUENCY	
· -	0,00	0,0000000	6,4156164	
	0.50	0.10988328	6.4155583	
	1.00	0,15493138	6,4153840	<b>.</b>
	1.50	0.18918446	0.4150954	
	2.00	0,#1769451	6 x1x1x32	
	3.00	0 26518383	6.4135232	
	3.50	0.23559510	6.4127665	
	4.00	0.30442781	6.4118926	
	4.50	0.32196256	6.4109012	
	5.00	0.33840444	6.4097921	
	5.50	0.35390881	6,4085647	
	6.00	0,26859688 	6.4072185	•
	0.20 0.20	0.30230330 A 30500333	6.403/327 K /n/1477	
	7.00	0.3+38/303	6 7024607	
	8.00	0.42087589	6.4006324	
	8.50	0.43263218	6,3986815	
	10.50	0.47563345	6,3896287	
	11.00	0.48552085	6.3870466	••••
	11.50	0.49510912	6,3843339	+ * * aut ***
	12.00	0.50441705	6.3814888	
	12.50	0.51346156	6,3785096	··· ···
	13.00	0.52225796	6.3753941	•••••
	13.50	0.53082919	6.3721402	
	16.20	0.57741967	0.54727272	
	17.00	A 50201750	6 7/08216	•••
	18 00	0.2-2/3-29	6 3362009	
	18.50	0.60591635	6.3314119	
	19.00	0.61255798	6.3264505	
	19.50	0.61906730	6.3213127	
	24.00	0.67254667	6.7663566	
	24.50	0.67799729	6.2591849	
	25.00	0.68336281	6.2517784	
	26.00	0.69385099	6,2362351	
	29.00	0,69397955	0,2280846 4 0404724	
	20 00	0.70403402	0.2190/21 6 2020218	
	34 50		5 0001536	
••	37 00	0.79324230	5 9837049	
	37.50	0 79724926	5 9677992	
	38,00	0.80122380	5.9514251	• •
· ·•	33.50	0.80516707	5.9345706	
	39.00	0.80908015	5.9172236	
	30.50	0.81296409	5.8993714	
	50.50	0.89256410	5.3463365	
	51.00	0.39596381	. 5.3118799	
<b>.</b>	51.50	0.82934705	5.2763549	
	27.00	0.90271400	5.239/126	
	27.20 K7 AA	0,90606478	<u> </u>	•···•
· · · · · · · · · · · ·	25.00	0.79939935	2.1620301	
• • ~	57 50	11,712(10)/ 0 07070500	2.1262170	
	50 00		4,7460420 //////	

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				مسعد بعد بسیدر چیز بو سعد بر به اعماد بیدر از ایندها
	DADAMETER S	ECCENTRICITY	FIGENERFOILENCY	
				•••••
* • •	58.50	0.94504658	4,6276009	
	59,00	0.74817410 0.95422639	4.5657560	
- ··· ··	60.00	0.95444299	4.4332291	
	60.50	0.95754418	4,3614518	···· ···
• •		· · · · · · · · · · · · · · · · · · ·		
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	a ۱۰۰ مان مان می باشد. های از مان می باشد می باشد و مان می باشد از مان می باشد از مان می باشد و مان می باشد مان مان مان مان مان مان ما های باشد از مان می باشد می باشد و مان و مان می باشد و باشد و مان و مان می باشد و مان می باشد و مان مان مان می	an in be annot a sea anna an anna an an an anna anna a		
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		<u> </u>		
	PARAMETER S	ECCENTRICITY	EIGENEREQUENCY	
•••				
••••••••••••••••••••••••••••••••••••••	0.00 ····		7.5012661	
	1.00	0.13272830	7.5011267	
	2.00	0.18687588	7.5007084	
	3,00	0.22788138	7.5000109	
	4.00	0.26200134	7.4990341	
	5.99	0.4916/481		
	· 6.00	0.20812444	7_4906403	
	<u>, , , , , , , , , , , , , , , , , , , </u>	0.34220034	7 . 4744221	
م ، ، ، محمد مع	0.00	0.00439773	7 1898286	
	10 00	0.00000000	7 4872710	-
	11 00	0 42194612	7 4843176	•
	12.00	0 43892586	7 4810769	
	14.00	0.47031033	7,4737252	
• •	15.00	0.48489296	7,4696097	•
	16.00	0.40883049	7.4651973	••
	17.00	0.51218056	7.4604849	
	18.00	0.52499273	7.4554691	
	10,00	0.53731000	7.4501458	
	22.00	0.57164733	7,4322842	<b>.</b>
	23.00	0.53234041	(,425081)	
	26.00	0.24264937	7 1442/0	
	2/ 00	0.00263407	7 1038252	
	20.00	0 616533241	7,4030326	••••
	22 00		7 3874002	
	34.00	0 63087328	7 3289732	
• • • • • • • • • • • • • • • • • • •	35,00	0.68849505	7.3176963	
· · · · · · · · ·	36.00	0.69593534	7.3059411	
· · · · · · · · · · · · · · · · · · ·	37.00	0.70320779	7,2936886	
	38.00	0.71032058	7,2809189	· - ·
	30.00	0.71723145	7.2676106	
	40.00	0.72409779	7.2537410	_
	50.00	0.78571713	7.0781346	
	51.00	0.79134719	7:0561698	
	>2.00	0.796990001	7.0356559	
	25.00	0.00237779	(,UUY343Y (,DQ/2054	• •
	55 00	0.00777037	Δ. 0583414	•. • •
·	56.00	0.819/2020	6 0341035	
······································	68 00	0.87809873	6 2059515	
	72.00	0.89683930	6 2927007	
	73.00	0.90145358	6.2359082	~• •• •
	74.00	0.90604000	6.1764261	
	75.00	0.91059948	6.1140736	
· · · · · · · · · · · · · · · · · · ·	76.00	0.91513233	6.0486460	
	77.00	0.91963875	5,9799100	
	80.00	0.93300027	5.7509484	•••
محم محم م	82.00	0.94177605	5.5755085	
	83.00	0.94612393	5.4793951	
	04.00 0r 00	0.95064483	5.3767322	
	05.00 8/ 00	U.Y3473845	2.2665996	· ·
· · · · · · · · · · · ·	87 00	9.79/12738 0 97657/0	4,034V0V7 / 47180/0	•
	97,VV	0.7(152(67	4.0/10040	-

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الل الواحد بالانتخاب المياد مواجد فداعت المحمد

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TABLE	A ORDER 7		 
PARAME	FR S ECCENTRICITY	EIGENEREQUENCY	
	0,000,000,000	8 6778765	
1.00	0.11618530	8.5777460	
2.00	0.16375864	8.5774743	
3.00	0.19989264	8.5770214	•••
4.00	0.23004934	8.5763873	
5.00	0,25635479	8.5755717	
6.00	0, 27990146	8.5745745 	
00 8	0.37134234	8.5729342	
00.00	0,33943509	8.5704906	
10.00	0.35670233	8.5687641	
11,00	0.37292105	8.5668545	
12.00	0.33826997	8.5647611	
13.00	0.40285188	8.5624836	
14.00	0.41675048	8.5600214	
15.00	0.45005503	8,5573739	
16.00	0,44270206 572077445	8 5770160	
20.00	0.47807412	8 5/13306	
21.00	0.49957721	8 5375549	
55.00	0.50980302	8.5335879	
23.00	0.51970898	8.5294283	<del>.</del> .
24:00	0.52931503	8,5250751	
25.00	0.53363917	8.5205268	
20.00	0.57342055	8,5003524	
50.00	0.58155190	8.4948049	
31.00	0.36947495	0,4890519 0,030045	
33 00	0.27721426		
34.00	0.61213696	8 4705370	,
35.00	0.61934134	8.4639381	
45.00	0.68349300	8.3853433	
46.00	0.68923371	8.3761283	
47.00	0.69486926	8.3666455	
48.00	0.70040337	8,3568886	
49,00	0.70583958	8.3468505	
- ····· 54 00	0. (1118130	8,3365241	
65 00	0.71063176	Q, 3737010 P 4707900	
66 00	0.78644750	8 12/11/00	
67.00	0 79030336	8 1072413	
68.00	0.79441001	8,0898536	
69.00	0.79346940	8,0719280	
70.00	0.80248343	8.0534442	
71.00	0.80645394	8.0343809	
94.00	0.38932407	7.3721437	
¥5,00	0.89268005	7.3300240	
96.00	0.09002230	7.2863920	
97.00	0.07952122	7.6411679	
90 00	0.90507020	7 1/57580	
100.00	0 90926177	7 0053695	
104.12	0.92270513	6.8663640	
106,28	0.92966936	6.7309014	
108.51	0.93677739	6.5777960	
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	PARAMETER	ECCENTRICITY	EIGENFREQUENCV	
	110-80	0 94/05724	6 2031140	
	113.17	0.95150197	6.2013427	
••••••	115,62	0.95911198	5,9643286	
		0.7000040	7,0771437	-
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	a ar a a se reagar ar and a dard a such and a sec and a sec a s	ninga ka <sup>n</sup> ta " 1887 m. Agin ala di kati kati ka kati ka di kati ka di kati ka di kati di Anti-anti ang kati kati kati kati kati kati kati kati		
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		u-12- 17 landa hara dala na seria any amin'ny amin'ny amin'ny amin'ny amin'ny amin'ny amin'ny amin'ny amin'ny a		
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		د به محمد می است است است با می باد به محمد به محمد به محمد به محمد می محمد می است است. مربو از داشته است		
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	TABLE A ORDER	8.	1999	
p	APAMETER	ECCENTRICITY	EIGENFREQUENCY	
	0 (10			
		0.0000000	7.0454215 G X/7259/	
	2 00	0.14580815	9 6473374	
	3.00	0.17310443	9 6468611	
	4.00	0.20511471	9 6464250	
····	5.00	0.22872306	9,6458642	and a second a second a second a second s
· · · · · · · · · · · · · · · · · · ·	6.00	0.24989872	9.6451787	
	7.00	0.26921929	9.6443683	
	8.00	0.28706227	9.6434329	· · · · · · · · · · · · · · · · · · ·
	<u>0.00</u>	0.30369073	9.6423724	
دُــَـَّ بالمسلحة بالله بالابنية ويشب المقاطعة ساير بريه ويتبد للولار.	10.00	0.31929081	9.6411807	· ·
	12 60	0.33402002 <u>A 37960120</u>	<u> 7,0570720</u> <u>0,4707380</u>	
ar an sangatan ar sanan Annonsa s	12.00	0.36128461	9 6368765	
میں ہو اسان است است کا ہے اور	14 00	0 37397809	9 6351881	
nja luunia mata anta a sakata kanana anta ka anta ka a	15.00	0.38613309	9.6333734	a a fan wegen yn af llans an wegen of y define af wegen fan ei ar an ar
	16.00	0.39780066	9.6314323	
n ng kanang at kanang manang sar ta pan a	17.00	0.40002400	9.6293644	nanada galana perioden yang salah salah sebagai yang seberar s
	18.00	0.41984054	9.6271696	
	10.00	0.43028215	9.6248474	
•	20.00	0.44037700	9.6223976	
• • • • • • • • • • • • • • • • • • •	24.00	0.47774232	9,6113147	
a ge a signing works to an east sectored and a surgery	2/ 00		<u> </u>	,
	27 00	0.44480794	9,6047773 0 2016737	
ana ana <b>k</b> abata ang kabata	28.00	0.51111354	<u> 7,0010424</u> <u> 0,001582</u>	anta anna 1999, an an Atalan - Andreada a su shua dhua na a sanaya firana a A
ann an ann a sann a sann a sann an ann an	29 00	0 51893251	9 5945418	
	30.00	0.52656300	9,5907931	and a second second second contract of the second
ana ana any soratra panangané arawa ng T	38.00	0.58177546	9.5559747	
	30.00	0,58804573	9.5510080	an air ann an 1963 ann an 1966 ann ann an 1969 ann
	40.00	0.59419364	9.5459020	
	41.00	0.60022369	9.5406559	
	42.00	0.60614010	9.5352686	
	43.00	0.61194634	9,5297391	1999 - 1999 (r. 1997) - 1999 - 1999 - 1997 - 199
ana an	44.00 5 ° 00	0.01764771	9,5240664	
	28,00 50 00	0.00602678	<u> </u>	and an area and and a second and areas
ana ana ang ang ang ang ang ang ang ang	65 00	0.09250790	<u> </u>	
	61 00	0 70123035	9.4120920	
······································	62.00	0.70549709	9 3958432	- en un anno 111 Anno 11 Anno 11 Anno 11 Anno 11 Anno 11
	63.00	0.70970369	9.3871510	·····
	64.00	0.71385171	9.3782776	
n daam oo ka sa maayoo faan hada daama oo ka hara ahaa ahaan ahaan ahaan ahaan ahaan ahaan ahaan ahaan ahaan ah	85.00	0.73977039	\$ 1428461	
	86.00	0.79294891	9.1288355	
	87.00	0.79609544	9.1145153	· · · · · · · · · · · · · · · · · · ·
-	88.00	0.79921090	9,0998764	-
	0 × 10	0.80229618	<u> </u>	
•	711.00 DA 60	0.00353618	• Y,0696032	·
	71.00	0.0405/7/6	<u> </u>	de angele al a defense a ser "aga ago a paragon any any defense a la baranananany. Any server a ra
1	20.76	0.02030270 0.38024105		
	23 46	0 89601088	8 2632593	
	26.25	0.90295427	8,1572811	Landring and mar and ranker come and parameters and save at a
1	20.13	0.91003282	8.0382244	······································
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	PARAMETER S	ECCENTRICITY	ETGENFREQUENCY	• • • • • • • • • • • • • • • • • • •
			7 2500405	
	100.01 	0. 2495527	7.7597772 7.6758536	··
·····	441 72	0.94063663	7 8738/42	<b>-</b>
	145.16	0.95120439	7.0358673	
	148.72	0.96206046	6.6211722	· ·
	152.42	0.97310912	6 0889508	<b></b>
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	e para en la composición de la composición en la composición en la composición de la composición de la composi La composición de la c	- 82 -	, a and a set of the set	
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TABLE A O	SOFK A		
PARAHETERS	ECCENTRICITY	EIGENFREQUENCY	
		· · · · · · · · · · · · · · · · · · ·	
0.00	0.0000000	10,7114340	
2.00	0 13145048	10.71(2520	
6 00	0.22574309	10 7098230	
8.00	0.25956171	10.7085690	e anna a san anna an anna an anna an anna an anna an an
10.00	0.28897834	10.7069570	· ····································
12.00	0.31523939	10.7049850	
14.00	0.33908680	10.7026520	
16.00	0.36100805	10.6999590	
18,00	0.38134318	10.6969040.	
20.00	0.400.54111	10 4807050	
24.00	0 43503970	10 6855580	
26.00	0.45100537	10.6810440	na ban in printing and a second second in the second
28.00	0.46613544	10.6761620	
30,00	0.48065806	10.6709100	alenda alfon ener "Alendaria pala " a such a successive a pellon impo
32.00	0.49449067	10.6652850	
34.00	0.50774015	10.6592880	
36.90	0.52045540	10,6529140	
<u> </u>	0.55267880	10,6461610	
46.00	0.37733300 0.52767757	10 4046330	n an
50.00	0 59749270	10 5975520	
52.00	0.60710626	10.5880720	narradhan annin - Alan ains anna anna anna an dar a du bhailte anna a dha a
54.00	0.61643239	10.5781880	
- 56,00	0.62548673	10.5678970	ante a cademine el la ante como comissional a cada cado del concerna finitati dell'Arte Cademi del
58.00	0.63423361	10.5571930	ан на армит и ималария на нарадија и на нарадија и сали и сали - са армит и ималари сали сали сали са сали са сали са сали са сали са сали са са сали са са сали са сали сали
70.00	0.68232848	10.4840190	د. الم الم الم المحمد المحمد المحمد المحم الم
72.00	0.00/775/	10.4702750	a y daga ngil handi dalay mangang ana ay ay ang dala at i manadir di sanaanin di sanaanin di sa
74.00	0.70376600	10 7743820	• • • • • • • • • • • • • • • • • • •
78.00	0.7055311	10.4262260	
80.00	0.71720545	10.4105750	
82.00	0.72370924	10.3944230	a sangananananan karananan ya sar sanga menera ya ƙafa n
102.03	0.78182200	10,2017750	
104.12	0.78726421	10.1779600	· · · · · · · · · · · · · · · · · · ·
106.28	().79276982	10,1525590	a 1. g. autorist for particular autoritation and a district of the state of the sta
108.21	0.79834975	10,1254190	
417 17	0.00307922	10,0903040	
115.62	0.81546949	10 0316790	المتعيد المالة والمتية للراسية
145.16	0.87848537	9 4797409	rhan a a an anna an an an an an an anna an an
148.72	0.88550162	9,3875735	anganangananangan angangan angangan sa sayan ang sa
152.42	0.89270119	9.2838500	
156.25	0.90010194	9,1664634	
160.23	0.90772244	9.0328054	
164.37	0.91309356	8.8617310	
10X.00 477 47	0.92641072	<u> </u>	
475.43	0.94215657	8 1388781	
177 78	0.94747406	7,9585287	n maar an ar 'n februik de skraan heerste de seren an en en een de 'n seren aan de seren aan de seren aan de s
180.17	0.95282792	7.7609791	annan Amerikanska provinska semistrati v samo se semistra.
187.62	0.95821842	7.5424990	
185.11	0.96364560	7.2979409	
187.65	0.96910914	7.0198755	
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TABLE A         OBDER 10           PARAMETER S         ECCENTRICITY         ELGENFREDUENCY           0.00         0.00000         11.770870           2.00         0.1071300         11.770840           4.00         0.14482653         11.770340           4.00         0.1482737         11.770450           4.00         0.25587741         11.766770           1.00         0.25692741         11.766770           1.00         0.25632741         1.766770           1.00         0.256326472         11.766740           1.00         0.256326472         1.7666350           1.1.700         0.256326472         1.7666350           1.2.00         0.25630635         1.7675460           2.00         0.3304826         17675460           2.00         0.3444265         17675460           2.00         0.3444265         17675460           2.00         0.3444265         17675460           2.00         0.346826         17675460           2.00         0.4441251         156550           2.00         0.4442253         1767400           2.00         0.444141         1726856           2.00         0.44444141		المراجعة من المراجعة في المراجعة الم		n na sere e s
TANLE A. DRBER 10           PARAMETER S         ECCENTRICTY         FLGENEREQUENCY           4.00         1.000000         11.7708770           2.00         1.1071300         17707440           4.00         1.0482633         17703440           4.00         1.0482633         17703440           4.00         1.04826371         17666200           4.00         1.2568872         1766240           10.00         1.2568872         1766350           12.00         0.25681662         1766350           14.00         0.3244226         1765400           15.00         0.3244226         1765350           12.00         0.344626         1765350           12.00         0.344626         1765350           12.00         0.344626         1765350           22.00         1.344626         1764350           22.00         1.344626         1764350           22.00         1.344626         1764740           22.00         1.344627         175440           24.00         0.4218745         1774740           25.00         0.4218745         1774740           26.00         0.4702213         172560				
TAULE A. DREE 10           PACAMETER S         ECCENTRICITY         EIGENEREQUENCY           0.00         0.000000         11.7708770           2.00         0.11071500         11.7708400           4.00         0.168053         11.7704400           6.00         0.16807317         11.7704400           6.00         0.16807317         11.7704400           6.00         0.16807317         11.7704400           6.00         0.16807317         11.7704400           6.00         0.16807217         11.7687400           8.00         0.268872         11.7687400           10.00         0.3698267         11.7687400           11.00         0.3108262         11.7687400           12.00         0.3108262         11.7687600           22.00         0.3492652         11.7680800           12.00         0.3492652         11.7683190           22.00         0.3492652         11.7683190           22.00         0.34927233         11.727860           23.00         0.4672733         11.7278560           24.00         0.54773633         11.727850           25.00         0.73736333         11.7278560           24.00 <td< th=""><th></th><th></th><th></th><th></th></td<>				
PARAMETER'S         ECCENTRICITY         ELGENFREQUENCY           0.00         0.0000000         11.7703740           2.00         0.11071300         11.7703740           4.00         0.1408063         11.770340           5.00         0.2508771         11.760450           4.00         0.2608072         11.760700           4.00         0.2608072         11.7670340           4.00         0.2608072         11.7670350           4.00         0.2608072         11.7670350           4.00         0.2608072         11.7670350           5.00         0.3504426         11.7670350           5.00         0.35044266         11.7670360           5.00         0.35044266         11.767540           5.00         0.35044266         11.767540           5.00         0.3504226         11.77516650           5.00         0.3504226         11.77516040           5.00         0.440723         11.7796026           5.00         0.440723         11.7796026           5.00         0.440723         11.7796026           5.00         0.440723         11.729805           5.00         0.4407223         11.729805 <t< th=""><th>TABLE A ORDE</th><th><u>R 10</u></th><th></th><th></th></t<>	TABLE A ORDE	<u>R 10</u>		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	PARAHETER S	FCCENTRICITY	EIGENEREQUENCY	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $				
$\begin{array}{c} 2, 0, 0, 0, 11971509, 11, 7707440, \\ 5, 0, 0, 0, 16827517, 11, 7703440, \\ 6, 0, 0, 0, 2368372, 11, 7765740, \\ 7703440, 0, 0, 2368372, 11, 7765740, \\ 780, 0, 0, 0, 2368372, 11, 7765740, \\ 780, 0, 0, 0, 2368372, 11, 7765740, \\ 780, 0, 0, 0, 236432, 21, 7765330, \\ 780, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0$	0.00	0.0000000	11,7708770	
$\begin{array}{c} 4, 00 & 0, 1082737 & 11, 7703440 \\ 5, 00 & 0, 236837741 & 11, 7703470 \\ 6, 00 & 0, 236837741 & 11, 766740 \\ 10, 00 & 0, 23683672 & 11, 76675470 \\ 10, 00 & 0, 23683652 & 11, 76675470 \\ 12, 00 & 0, 23683652 & 11, 76676330 \\ 14, 00 & 0, 31041148 & 11, 766330 \\ 15, 00 & 0, 32044226 & 11, 7653840 \\ 16, 00 & 0, 33043226 & 11, 7653840 \\ 16, 00 & 0, 33043226 & 11, 7653640 \\ 22, 00 & 0, 33746229 & 11, 765030 \\ 22, 00 & 0, 33746229 & 11, 755660 \\ 22, 00 & 0, 33746229 & 11, 755660 \\ 23, 00 & 0, 13746429 & 11, 7560260 \\ 24, 00 & 0, 13764513 & 11, 7560260 \\ 25, 00 & 0, 1466513 & 11, 725650 \\ 26, 00 & 0, 1466513 & 11, 725650 \\ 26, 00 & 0, 1476723 & 11, 725650 \\ 36, 00 & 0, 14767233 & 11, 7247020 \\ 35, 00 & 0, 147672617 & 11, 7225190 \\ 44, 00 & 0, 50167546 & 11, 7117140 \\ 44, 00 & 0, 52412976 & 11, 7028770 \\ 44, 00 & 0, 52412977 & 11, 7028770 \\ 45, 00 & 0, 52412976 & 11, 7028770 \\ 45, 00 & 0, 52412976 & 11, 765030 \\ 58, 00 & 0, 57679090 & 11, 6650120 \\ 58, 00 & 0, 57679090 & 11, 6650120 \\ 58, 00 & 0, 57679090 & 11, 6650120 \\ 58, 00 & 0, 5876771 & 11, 6571910 \\ 60, 60 & 0, 5876937 & 11, 6646810 \\ 66, 00 & 0, 5876937 & 11, 6646810 \\ 66, 00 & 0, 5876937 & 11, 6646810 \\ 66, 00 & 0, 67698372 & 11, 6646810 \\ 66, 00 & 0, 67698372 & 11, 6646810 \\ 66, 00 & 0, 67698372 & 11, 6646810 \\ 66, 00 & 0, 67698372 & 11, 6646810 \\ 66, 00 & 0, 67698372 & 11, 664680 \\ 66, 00 & 0, 67698372 & 11, 664680 \\ 66, 00 & 0, 67698372 & 11, 664680 \\ 66, 00 & 0, 67698372 & 11, 664680 \\ 66, 00 & 0, 67698372 & 11, 664680 \\ 66, 00 & 0, 67698372 & 11, 664680 \\ 66, 00 & 0, 67698372 & 11, 6650120 \\ 58, 00 & 0, 67698372 & 11, 6650120 \\ 58, 00 & 0, 67698372 & 11, 6650120 \\ 58, 00 & 0, 67698742 & 11, 657920 \\ 65, 00 & 0, 67698742 & 11, 657920 \\ 65, 00 & 0, 67698742 & 11, 657950 \\ 158, 21 & 0, 7064778 & 11, 4005550 \\ 158, 21 & 0, 7064874 & 10, 1066760 \\ 157, 12 & 0, 70788731 & 1, 0164110 \\ 169, 62 & 0, 6768742 & 10, 1066970 \\ 169, 65 & 0, 9768742 & 10, 1066970 \\ 169, 65 & 0, 9768742 & 10, 10651970 \\ 169, 65 & 0, 9768747 & 11, 055470 \\ 169, 65 & 0, 9768747 & 10, $	2.00	0.11971369	11,7707440	
$\begin{array}{c} 5.00 & 0.087/317 & 1.170030 \\ 1.7605790 \\ 1.00 & 0.2368872 & 11.7605790 \\ 1.00 & 0.26810452 & 11.760530 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.7605310 \\ 1.775050 \\ 1.7605310 \\ 1.77500 \\ 1.77500 \\ 1.77500 \\ 1.77500 \\ 1.77500 \\ 1.77500 \\ 1.77500 \\ 1.77500 \\ 1.77500 \\ 1.77000 \\ 1.77000 \\ 1.77000 \\ 1.$	4.00	0.16869653	11,7703440	
3, 00 $0, 23683872$ $1, 7667470$ $10, 00$ $0, 26810467$ $1, 7675470$ $10, 00$ $0, 26810467$ $1, 766350$ $14, 00$ $0, 3101148$ $11, 7663510$ $15, 00$ $0, 2367426$ $11, 763540$ $14, 00$ $0, 31038226$ $11, 763540$ $14, 00$ $0, 33038226$ $11, 763540$ $14, 00$ $0, 3492252$ $11, 763540$ $200$ $0, 334226$ $11, 7575460$ $22, 00$ $0, 334229$ $11, 7575460$ $22, 00$ $0, 39947323$ $11, 750260$ $24, 00$ $0, 4072233$ $11, 72940550$ $24, 00$ $0, 477365331$ $11, 7225190$ $24, 00$ $0, 477365331$ $11, 7225190$ $46, 00$ $0, 52172823$ $11, 711746$ $44, 00$ $0, 52172823$ $11, 717146$ $44, 00$ $0, 5727976$ $11, 263710$ $55, 00$ $0, 5742976$ $11, 627470$ $56, 00$ $0, 5742972$ $11, 6490770$ $56, 00$ $0, 57429721$ $11, 6490770$ $56, 00$	5.00	0.10827217	11 7406796	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	8.00	0.236888872	11.7687470	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	10.00	0.26392167	11.7675490	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	12.00	0.28810482	11.7660830	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	14.00	0.31011148	11.7643510	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	15.00	0.32044726	11,7633840	· · · · · · · · · · · · · · · · · · ·
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	10.00	0.33038420	11.7623319	······································
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		0.34922432	11 7575460	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	22,00	0.38346829	11,7547400	
$\begin{array}{c} 2  8  0  0 & 0 & -4  46  67  22  13 & 11  75  00  26  0 \\ 2  6  0  0 & -6  44  68  61  1 & 17  74  83  19  0 \\ 3  8  0  0 & -6  42  32  87  45 & 11  .74  47  02  0 \\ 3  5  0  0 & -6  42  32  87  45 & 11  .74  47  02  0 \\ 3  5  0  0 & -6  42  32  87  45 & 11  .72  85  10  0 \\ 4  0  0 & 0 & -6  10  75  46 & 11  .72  75  10  0 \\ 4  0  0 & 0 & -5  12  72  82  3 & 11  .71  72  50  50 \\ 4  0  0 & 0 & -5  12  72  82  3 & 11  .71  17  14  0 \\ 4  0  0 & 0 & -5  12  72  82  3 & 11  .71  17  14  0 \\ 4  0  0 & 0 & -5  12  72  82  3 & 11  .71  17  14  0 \\ 4  0  0 & 0 & -5  12  72  82  3 & 11  .71  17  14  0 \\ 5  0  0 & 0 & -5  12  72  82  3 & 11  .71  17  14  0 \\ 5  0  0 & 0 & -5  12  72  82  3 & 11  .71  17  14  0 \\ 5  0  0 & 0 & -5  12  72  82  3 & 11  .6  50  12  0 \\ 5  6  0  0 & 0  .5  23  14  26  37  1 & 17  0  28  50  0 \\ 5  6  0  0 & 0  .5  23  14  0  37  13  .6  49  17  0 \\ 5  6  0  0 & 0  .5  84  81  .6  31  1  .6  51  10  0 \\ 6  0  0  0  0  .5  87  63  11  1  16  57  10  1 \\ 6  0  0  0  0  .5  87  63  21  11  .6  51  16  60  0 \\ 6  6  0  0  0  0  .6  15  55  0 \\ 6  0  0  0  0  .6  15  55  0 \\ 6  0  0  0  0  .6  67  55  60  0 \\ 6  0  0  0  0  .6  67  67  63  1  11  .6  77  87  0 \\ 6  0  0  0  0  .6  72  87  93  11  12  24  67  23  0 \\ 6  0  0  0  0  .6  72  87  73  1  14  54  89  60  0 \\ 6  12  0  .7  75  97  13  1  12  34  90  0 \\ 13  2  1  0  .6  66  13  2  1  1  07  63  11  .6  57  10  26  18  82  0 \\ 6  13  1  0  .6  12  57  63  1  1  12  24  0  21  0  .6  13  22  0  0  11  12  24  07  23  0 \\ 13  1  0  6  17  13  73  1  10  0  11  14  77  37  22  0 \\ 13  2  1  0  .6  66  10  34  2  1  1  07  64  1  13  07  95  1 \\ 13  12  0  .7  14  13  10$	24.00	0.39917323	11,7516650	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	25.00	0.40672213	11.7500260	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	26.00	0.41408411	11.7483190	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	<u>έχιύ</u> <b>7</b> ει ο Δ	0.42828745	11,7447020	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	35,00 36,00	0.4/350205 <u>0.4/350205</u>	11 7275050	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	38.00	0.49084218	11.7225190	· · · · · · · · · · · · · · · · · · · ·
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	40.00	0.50197546	11.7172560	adarita a sant na manaka manaka manaka manaka manaka ma
44,00 $0,52819976$ $11,708930$ $45,00$ $0,52819976$ $11,708770$ $55,00$ $0,57689827$ $11,6688130$ $56,00$ $0,5709904$ $11,6680120$ $58,00$ $0,5705701$ $11,6671910$ $60,00$ $0,59583377$ $11,6496770$ $62,00$ $0,60389832$ $11,6496680$ $64,000$ $0,61554692$ $11,6274970$ $65,00$ $0,61554692$ $11,6274970$ $88,000$ $0,6758921$ $11,5219760$ $86,000$ $0,67259791$ $11,518600$ $88,000$ $0,67259791$ $11,5083760$ $90,000$ $0,6764278$ $11,4905550$ $92,000$ $0,70418301$ $11,4773920$ $95,000$ $0,71257932$ $11,4569960$ $220,76$ $0,77599115$ $11,2267830$ $120,76$ $0,77599115$ $11,2267830$ $120,76$ $0,77599135$ $11,2677830$ $120,76$ $0,77599135$ $11,926490$ $120,13$ $0,70384008$ $11,1630100$ $55,12$ $0,78781939$ $11,1928490$ $120,13$ $0,8780930$ $10,3228700$ $138,41$ $0,81235064$ $11,0594840$ $141,72$ $0,8780930$ $10,3258700$ $185,11$ $0,8978930$ $10,3258700$ $185,11$ $0,89678874$ $10,1606970$ $192,90$ $0,96679047$ $9,9449219$ $198,61$ $0,9168874$ $10,1606970$ $192,90$ $0,96679047$ $9,8293304$ $122,12,12$ $0,96679047$ $9,8293304$ $132,612$ <	42.00	0.51272823	11,7117140	
45:00       0.52819976       11.7028770         55:00       0.57489827       11.6688130         56:00       0.57020904       11.6650120         58:00       0.57020904       11.6571910         60:00       0.5928317       11.6490770         62:00       0.60389832       11.6490770         62:00       0.61554692       11.6274970         65:00       0.61554692       11.6274970         65:00       0.648359921       11.5219760         86:00       0.668359921       11.5158600         86:00       0.67259701       11.5033760         92:00       0.70448301       11.4773920         92:00       0.704807478       11.4608820         92:00       0.7098074       11.4638820         92:00       0.7098074       11.4638820         92:00       0.7098074       11.4638820         92:00       0.7098074       11.4638820         92:00       0.7098074       11.4638820         92:00       0.7098074       11.4638820         92:00       0.7098074       11.4638820         92:00       0.7098074       11.4638820         120:76       0.7354008       11.1630100	44.00	0.52312637	11.7058930	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	45.00	0.52819976	11.7028770	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	>5.00	0.57489827	11.6688130	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		0.58745704	11 6520160	· · · · · · · · · · · · · · · · · · ·
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	60.00	0.59588317	11.6490770	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	62.00	0.60389832	11,6496680	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	64.00	0.61171238	11.6319620	
85.00 $0.68359921$ $11.5219760$ $86.00$ $0.68662934$ $11.5158600$ $87.00$ $0.68662934$ $11.5158600$ $90.00$ $0.69844778$ $11.4905550$ $92.00$ $0.70418301$ $11.4773920$ $94.00$ $0.70980747$ $11.4638820$ $95.00$ $0.71257932$ $11.4569960$ $120.76$ $0.77599115$ $11.2467830$ $126.25$ $0.78781939$ $11.1928490$ $129.13$ $0.79384008$ $11.1630100$ $135.21$ $0.86610342$ $11.0965750$ $138.41$ $0.81235064$ $11.0594840$ $141.72$ $0.8167873$ $11.0194110$ $185.11$ $0.39780930$ $10.3258700$ $137.65$ $0.9678874$ $10.1606970$ $190.25$ $0.90178710$ $10.0551970$ $192.90$ $0.9950947$ $9.9449219$ $198.37$ $0.91679047$ $9.9449219$ $198.37$ $0.91679047$ $9.7077798$ $210.04$ $0.93694711$ $9.1441117$ $213.12$ $0.94200917$ $8.9775317$	65.00	0.61554692	11.6274970	
66,00 $0.5362734$ $11.5156600$ $88,00$ $0.69259791$ $11.5033760$ $90,00$ $0.69364778$ $11.4905550$ $92.00$ $0.70418301$ $11.4773920$ $94.00$ $0.70980747$ $11.4638820$ $95.00$ $0.71257932$ $11.4569960$ $120.76$ $0.77599115$ $11.2467830$ $126.25$ $0.78781939$ $11.1928490$ $126.13$ $0.79993406$ $11.1928490$ $126.13$ $0.79993406$ $11.1928490$ $135.21$ $0.80610342$ $11.09950$ $135.21$ $0.80610342$ $11.0965750$ $138.41$ $0.81235064$ $11.09954406$ $141.72$ $0.81667873$ $10.094410$ $89.62$ $0.33780930$ $10.3258700$ $185.11$ $0.89179567$ $10.2618820$ $-187.65$ $0.99178710$ $10.9551970$ $190.25$ $0.99178710$ $10.9551970$ $192.90$ $0.99679047$ $9.9449219$ $195.61$ $0.91681237$ $9.7077788$ $210.04$ $0.93694711$ $9.1441117$ $213.12$ $0.94200917$ $8.9775317$	85.00	0.68359921	11.5219760	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	80.00	0.00662434	11.5150600	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	90.00	0.07257731	11 4905550	
94.00 $0.70980747$ $11.4638820$ 95.00 $0.71257932$ $11.4569960$ 120.76 $0.77599115$ $11.2467830$ 126.25 $0.78781939$ $11.1028490$ 120.13 $0.79384008$ $11.1630100$ 132.12 $0.79003406$ $11.1309950$ 135.21 $0.80610342$ $11.0965750$ 138.41 $0.81235064$ $11.0965750$ 138.41 $0.81235064$ $11.094840$ 141.72 $0.81667873$ $11.0194110$ 182.62 $0.38780930$ $10.3258700$ 185.11 $0.89678674$ $10.166970$ 190.25 $0.96178710$ $10.0551970$ 192.90 $0.99679047$ $9.2449219$ 195.61 $0.91681237$ $9.7077798$ 210.04 $0.93694711$ $9.1441117$ 213.12 $0.94200917$ $8.9775317$	92.00	0.70418301	11,4773920	
95.00 $0.71257932$ $11.4569960$ 120.76 $0.77599115$ $11.2467830$ 126.25 $0.78781939$ $11.1928490$ 120.13 $0.79384008$ $11.1630100$ 132.12 $0.79993406$ $11.1309950$ 135.21 $0.86610342$ $11.0965750$ 138.41 $0.81235064$ $11.0594840$ 141.72 $0.81667873$ $11.0194110$ 182.62 $0.33780930$ $10.3258700$ 185.11 $0.39678874$ $10.1606970$ 190.25 $0.96178874$ $10.0551970$ 192.90 $0.99679047$ $9.9449219$ 195.61 $0.91681237$ $9.7077798$ 210.04 $0.93694711$ $9.1441117$ 213.12 $0.94200917$ $8.9775317$	94.00	0.70980747	11.4638820	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	95.00	0.71257932	11.4569960	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	120.76	0.77599115	11.2467830	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	146.65	0.78781939	11.1928490	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	164.15 435.12	0,79384998	11.1630100	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	135 21	0.19993400	11 0965750	وعادمها المترام متصل
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	138,41	0.81235064	11,0594840	· · · · · ·
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	141.72	0.81867873	11.0194110	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	182.62	0.83780930	10,3258700	
-       167.65       0.89678874       10.1606970         190.25       0.96178710       10.0551970         192.90       0.90679947       9.9449219         195.61       0.91681287       9.7077798         210.04       0.93694711       9.1441117         213.12       0.94200917       8.9775317	185.11	0.89179567	• 10,2618820	• • • • • • • • • • • • • • • • • • • •
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	- 187,65	0.89678874	10.1606970	
195.61     0.91681287     9.8293304       •     198.37     0.91681287     9.7077798       210.04     0.93694711     9.1441117       213.12     0.94200917     8.9775317	170.62	0.74178710	<u> </u>	
198.37         0.91681287         9.7077798           210.04         0.93694711         9.1441117           213.12         0.94200917         8.9775317	198 61	0 ¢1429804	9 R2937.04	
210.04     0.93694711     9.1441117       213.12     0.94200917     8.9775317	198.37	0.91681287	9,7077798	······································
213.12 0.94200917 8.9775317	210.04	0.93694711	9.1441117	
	213.12	0.94200917	8.9775317	

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PARAMETER S	ECCENTRICITY	EIGENFREQUENCY	
216.26	0.24708705	8,7970697	· · · · · · ·
219 48	0.25218305	8,6000578	- · · .
222.77	0.95729933	8.3830187	· · · - · ·
226.13	0.96263762	8,1412860	······································
229.57	0.96759911	7.8683559	
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		an mana galangin na ang 1 a ang mananan. Pana ana bara mang pang bin kanana ng mananana na ang na mang na mang mang	
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TABL	EA ORDER 11		
PARAM	ETER'S EC	CENTRICITY	TGENFREQUENCY
- <u>0</u> .(	0.	0000000	2,8264910
2.1	νο 10	16/08727	12 826.5870
4.0 	0	18925124	2 8255760
8.0	0	21787723	2.8248640
10.0	0.0	24287136	2.8239480
12.(	0.	26526789	2,8228280
14.	() () () () () () () () () () () () () (	28568102 20/54305	2.8215040
10.0	0.	3220421202	2 8182440
20.0	0.	33848570	2.8163080
22.(	0.	35398520	2,8141660
24.7	0.	36866672 1	2.8118190
26.(	10 0.	58262099 1050///////////////////////////////////	2.8092660
68.V 30 (	0.	272944772 60868561 1	2 8082070
32.(		42090248	2.8003690
34.0	0.	43264350	2.7969900
42.(	0.	47556435	2,7813860
44.(	0.	48542646	2.7769600
46,1 46,1	(0)	49498719	2 7676760
50.0	0.	51327742	2.7624150
52.0	0.1	52203894	2.7571410
.54.0	0.	53056361	2,7516520
64.0	0.	57003930	2.7209640
06.0 60 (	0.	57737543 58787035	2 2024560
70 (	0	59154623	2 6999170
72.(	0.	59839873	2.6924550
74.(	) Q () . (	50510374 1	2.6847690
76.(	0.0	51166710	2.6768560
100.0	0.0	58168229 58768229	2,5650930
102.0	2	59154418	2 5407370
106.2	.8	69687425	2.5282950
108.5	0.1	10227151	2.5151490
110.8	0.	10773677	2.5012490
113.1	0.	1327084	2,4865410
142 7	· · · · · · · · · · · · · · · · · · ·	78526488 1	2 2477750
152.6	2	79184909 1	2.1840730
156.2	0.1	79843570 1	2.1477880
160.7	0.8	30510585 1	2.1086380
164.3	0.0	<u>1186159</u>	2,0662970
108.0	2 2	3) 374347 1 18206606 1	1 2050330
216 2	6 0.8	38379638	1.2011390
210.4	.8 0.8	9369307 1	1.1039020
222.7	.0.8	9855258 1	1.0039250
226.1	3 0.9	10337346 1	0.9009950
229.5 777 (	0.9	100746	U,794773U D &848150
242 0	0	3155609	0.1936050
256 0	5	3617761	0 0526550

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	PARAMETER S	ECCENTRICITY	EIGENFREQUENCY	
	256.00	0 24080188	9 0013426	· · · · · · · · · · · · · · · · · · ·
	260.15	0.94544103	9,7374431	
	264.39	0.95010764	9.5581804	
	268.74	0.95481415	9.3600527	
	273.21	0.95957617	9,1385545	
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TABLE	A ORDER 12				
PARAHE	FR S EC	CENTRICITY	(	IGENERE	QUENCY
0.00	0.	00000000		3 87884	30
5.00	0.	10163350	· · · · · · · · · · · · · · · · · · ·	3.87876	40
4.00	0.	14336132		13,87852	250
6.00	Э.	17513032		13,87812	270
00.8	0.	20170737		13.87757	·0)
10.00	0.	22404243	· · · · · · · · · · · · · · · · · · ·	3.87685	540
12.00	0.	24578840		13.87597	90
14.00	0.	26481272		13.87494	40
16.00	9.	28238625		3.87374	.90
18.00	0.	29876737	,	13,87239	>50
<b>2</b> 0.00	0.	31414478	· · · · ·	13.87088	320
SS.00	0.	32866138		13186920	)80
24.00	Ŋ.	34242352		13 86737	40
28,00	0.	35553505		13,86538	300
30.00	0.	36805322		13.86322	250
32.00	0.	38004277		13.86090	190
34.00	0.	39155377		13-85843	\$30
36.00	0.	-40262874		13185579	>50
38.00	0.	41330411		13085299	60
40.00	0.	. 42361142		13:85003	\$40
50.00	0.	47906240		13185884	,70
52.00	0.	48781040		13.82474	20
54.00	0.	49554145		13.82047	20
56.00	0.	50346703	· · · · · · · · · · · · · · · · · · ·	13781603	37 <u>0</u>
58.00	0.	.51119762	· · · · · · · · · · · · · · · · · · ·	13,81143	350
60.00	0.	51874284		13.80666	580
65.00	0.	52611155		13 80173	330
80.00	Ô,	.58565780		13.7497	100
82.00	0.	. 59162710		13,74306	500
84.00	0.	59748428		13,73624	450
86.00	υ.	60323323		13,72925	550
38.00	0.	60887765		13.72208	390
90.00	0.	61442100	· · · · ·	13.71471	150
92.00	÷.	. 61986658		13,70722	240
118.15	0.	68331973		13,59205	550
120.76	0.	68307338		13:57878	310
123.46	0.	69470491		13.56471	130
126.25	0.	,70051384		13.54978	380
129.13	0.	70640166		13.53394	,30
132.12	0.	71236935		3,51710	50
135.21	0.	71841789	•	13.49919	>50
168.66	0.	77664650		13.27193	580
173.13	0.	78355421 -		3 23659	>30
177.78	0.	79055296		13,19845	560
182.62	<b>0</b> .	79764390		13,15722	230
187.65	<u> </u>	80482838		13.11254	150
192.90	0.	81210807		13 06401	7.0
198.37	0.	81948503		13.01116	510
242.00	0.	88410820		12,17616	500
251.95	0.	88885251		12.08799	S0
256.00	0.	89350227		11.99985	510
260.15	0.	89805346		11.91177	10
264 39	Ó.	90250518		11.82366	50
268.74	0.	90686057		1,73526	510
273 21	<u> </u>	01112757		11 61607	260

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PARAMETER S	ECCENTRICITY	EIGENFREQUENCY	
302.46 307.79 313.26 312.88	0.93598333 0.94027463 0.94469579 0.94927531	11.0245970 10.8861910 10.7290690 10.5485540	
324.65	0.95403660 0.95899717	10,3389920 10,0932700	······································
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TABLE A ORDE	R 13		
PARAMETER S	ECCENTRICITY	EIGENFREQUENCY	······································
0.00	0.0000000	14.9283740	
2.00	0.09452135	14,9283110	
4.00	0.13337550	14.9281210	• .
6.00	0.16208830	14.9278040	
8.00	0-18778640	14_9273600	
10.00	0.20948893	14_9267890	
12.00	0.22897930	14.9260910	
14.00	0.24678545	14.9252660	
16.00	0.26324976	14.9245140	··
18.00	0.4/86144	14,9232320	
20.00	0.27504769	14.9220200	
27.00	0.20060045	14.9200930	
24.00	0.31963700	14,9192340	<u> </u>
20 00	A 3/ 1776/ 6	14,9170420	
<u> </u>	0.34377440	14.9137200	
34 00	0.376/1966	17.0100120	
36 00	0 38651824	14.9100129	
30.00	0.39297772	14 0054260	
40.00	0.40572349	14 0029400	
42 00	0 41487736	14 9003260	
44.00	0.42376056	14,8975820	
60.00	0.48682029	14.8709580	• • • • • • • •
62.00	0.49387232	14.8670420	
64.00	0.50076912	14.8629930	
66.00	0.50751762	14,8588130	
63.00	0.51412425	14.8545000	
70.00	0.52059500	14.8500550	
72.00	0.52693542	14.8454760	
94.00	0.58935726	14,7862040	
96.00	0.59446058	14,7799940	
98.00	0.59948153	14,7736450	
100.00	0.60442258	14.7671570	
102.03	0.60935941	14.7604260	····
104.12	0.61436692	14.7533360	
106.28	0.61944632	14.7458640	
132.12	0.67446578	14,6433030	
135.41	0.03041/89	14.6293750	
158.41	0.08645639	14.6145600	
141.72	0.69258492	14.5988090	
145.10	0.07880050	14.5820200	
<u>148.76</u>	0.70510755	14.5641320	
45/ 25	0.71150057	14.5454390	
126.63	0.790783/2	14.5240400	• ••• •
20/ 08	0 72856196	14. 3463790	
215.04	0.70594417	14 1703/80	
214 26	0.12384413	14.1202560	
220 77	0.000010128	14 0656080	•- ·· ,
220 57	0.81022545	14 0058210	
234 69	0.82223605	13 0402040	
293 21	0 88023222	12 0075590	'
297 27	0 89326812	12 0323460	
202 46	0 89774130	12 8709670	
* ^ * 70	0.004.04020	16,010/01V 80.0407030	

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	PADAMETER S	FCCFNTRICITY	FIGENEPEONENCV	·
	PARROTETEA	TO CLATALLET	LIGENTREGUNG	
· · · · · · · · · · · · · · · · · · ·	313.26	0.90498178	12.7566360	
	318.88	0.90861696		
	324.05	0.91222407	16,6424950	
	509.02 · · · · · · · · · · · · · · · · · · ·	0.74121008	11,8303649	
	17.04 18.1.7	0.94035027	11,0322020	
	788 26	0.95560657	11 1927000	
	- 392 12	0.95932218	10 9675600	
· · · · · · · · · · · · · · · · · · ·	395 03	0.96308749	10 7207830	
	400.00	0.96690236	10,4482210	• • • • •
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	TABLE A ORDER	2 14		
· · · · · · · · · · · · · · · · · · ·	PARAMETER	ECCENTRICITY	EIGENFREQUENCY	
	0.00	0.00000000	15,9754390	
•	2.00	0.08835126	15,9753870	
• • • • • • • • • • • • • • • • • • • •	4.00	0.12479420	15.9752330	
	6.00	0.15243433	15.9749760	
	8.00	0.17567541	15,9746160	
	10.00	0.19603225	15,9741540	
	12.00	0.21432971	15.0735880	
	14.00	0.23105839	15,9729200	
	16.00	0,24654948	15,9721480	
	18.00	0.26099772	13.9712740	
		0.27427923		
	22.00	0.20026675	15.9696100	
	24.00	<u>0.24960005</u>	15.0667/50	
· · · · · · · · · · · · · · · ·	28 00	0 32246278	15 0453550	
	30.00	0 33315697	15 0638610	
	38 00	0 37218249	15,9568510	
•• •• ••	40.00	0.38114855	15,9548390	
······································	42.00	0.38984458	15,9527230	
	44.00	0.39828890	15.9505030	
	46.00	0.40649779	15,9481780	
	48.00	0.41448584	15,9457490	
	50.00	0.42226614	15,9432160	
	66.00	0.47824934	15.9191640	
	68.00	0.48458477	15.9156820	
	70.00	0.49079423	15.9120940	
	72.00	0.49688236	15.9083980	
	74.00	0.50285546	15,9045970	
	76.00	0.50871652	15,9006880	• - p === ====
	78.00	0.51447024	15,8966710	و ودمان مورد و م
	106.28	0.53623961	15,8282300	
	108.51	0.29124748		,
	11().00	0.39633121	12.812640	
	115.1/	0.00149220	15.8082029	
	410 45	0.00075189	15 2020140	
• • • • •	120.76	0.61745309	15 7846060	
- • • • • • •	152 42	0.67628422	15 6680020	
	156 25	0.63268256	15.6518340	
	160.23	0.68918067	15,6345670	
·	164.37	0.69578005	15.6161050	
	168.06	0.70248214	15.5963470	
	173.13	0.70928841	15.5751760	
	177.78	0.71620025	15 5524660	
	227.77	0.77544821	15.2942620	
	229.57	0.78336439	15.2487490	
	236.69	0.79139812	15.1991470	
	244.14	0.79954869	15.1449640	• •
	251.95	0.80781746	15.0856260	
	260.15	0.81620539	15.0204620	
<b>.</b>	264.30	0.82044442	14.9854500	
	336.07	0.88792346	14.0153110	·
	347.94	0.89131162	13.9898550	
	7/0 20	0 R0/SAR30	13 0686050	

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PARAMETER S	FCCENTRICITY	FIGENEREQUENCY	
	and and the second of the second s		
362.81	0.90098941	13.9247160	
369.82	0,90432703	13 8932470	
• 377.04	0.90786589	13 8488320	
425 12	0.93709623	12 0996310	
420 54	0 94075852	12 8284400	
/2/ 02	0.04012052	12.0204409	
424,∨2 	0.74440007	16,04210999 40,110780	
428,20	0.94820192	12,4440700	
643.61	0.95210233	12,2276000	
447.92	0.95600257	11,9905280	
452.69	0.95996274	11.7307510	
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	TABLE A ORDER	15		
	PARAMETER S	ECCENTRICITY	EIGENFREQUENCY	
	n 00		17 0203230	····
	2 00	0.000000000	17.0202810	
	× 00		17 0201540	
	4.00	1/3/7550	17 0100/30	· -
	······································	<u> </u>	17.0197430	• •
	10.00	0.10004207 0.10004207		
, 	17.00	0.10420700	17.01760/0	••
	1/ 00	A 21 702070	17 6482536	
:	14.00	0.61722076	57 A47640A	
·····		0,60106000 	17.0170	
	2.00	5 25 5240 70	17.0102000	
	· · · · · · · · · · · · · · · · · · ·	0,2001704 5000000	11, UTQUYTU 67 04/3740	
	24.00	0,60206737	11.014C300	
	20.00	11.273030777	17,01,2170V 57,04,20766	
	<u> </u>	0,30301440	17,0120300	
	30.00	0.31373948	17.010090	·
	32.00	0.02350000		
	34.00	122142660	17,0080990	
	36.00	0.34200134	17,0066170	
	44.00	0.37363379	16.9998300	
	46.00	0.38545580	16.9979280	
	48.00	0.34107015	16.9959340	
	50.00	0.39849104	16,9938540	
من المناد محدي	52.00	0.49572952	16.9916899	******
	54.00	0.41279558	16,9894380	
	56.00	0.41969832	16.9871000	-
_	78.00	0.48681559	16.9556900	
	80.00	0.49225313	16,9523120	
	82.00	0.49759779	16.9488470	
	84.00	0.50285231	16.9452950	
	00.88	0.50302124	16,9416540	
	120.76	0.58645214	16,8641410	
	123.46	0.59179266	16.8569790	
	126.25	0.59721939	16.8493980	
	129.13	0.00273401	16.8413670	
	132.12	0.60833825	16,8328540	
	135.21	0.61403335	16.8238230	
	138.41	0.61982256	16.8142360	
	173.13	0.67640949	16,6943950	
	177.78	0.68322919	16.6760980	
	182.02	0.69016201	16.6564700	
	187.65	0.69720974	16.6353920	
	192.90	0.70437410	16.6127290	
	198.37	0.71165681	16,5883290	
	204.08	0.71905950	16,5620250	
	260.15	0.78277332	16,2545380	•
	268.74	0.79131658	16,1988790	-
	273.21	0.79563749	16,1690450	
	277.78	0.79999136	16,1377600	
	282.47	0.80437825	16,1049320	·•
	287.27	0.80951222	16,0428580	· -··
	29.2.21	0.31534671	15 0525810	
	416.49	0 89608144	15 1737860	
	420 78	Ax000x0	15 1520670	
	425.12	0 90002891	15 1237840	
	420 54	0 90347150	15 0883710	
	₩ 24 <sup>-</sup> 4 <sup>4</sup> <sup>14</sup>	9.796.11.999		-

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سراجع المارات المحمد بأراب المرابية مترجع مرجع التربية مستنج بمحمد المراجع محرجة متراجع محرجة المراجع المراجع

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PARAMETER S	ECCENTRICITY	EIGENFREQUENCY	
		15:0/82060	
424.92 X32 58	00000000000000000000000000000000000000	12,0452900	
447.21	0 90932433	14 0341390	
483.03	0.93603007	13,9290280	<del>-</del>
488.39	0.93986338	13.7417840	
493.83	0.94376230	13,5391860	
499.36	0.94772662	13,3191350	
504.99	0.95175780	13,0790680	
510.71	0.95585639	12.8157870	
516.23	0,96002234	12.5252080	
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AbaAMETER'S       ECCENTRICITY       EIGENFREQUENCY         0.00       0.0000000       1.8411838         0.10       0.16937246       1.8535189         0.20       0.25629806       1.8635013         0.30       0.25626206       1.8635013         0.400       0.35562255       1.8774147         0.400       0.35562266       1.8636990         0.400       0.35564222       1.9003552         0.600       0.35846995       1.9144032         0.70       0.41511274       1.9224222         0.80       0.43841242       1.931508         0.90       0.45902878       1.96436871         1.00       0.47941562       1.9640387         1.10       0.474308       1.96436871         1.30       0.52932503       1.9940545         1.40       0.5466037       1.9940545         1.40       0.5464037       1.9947346         1.60       0.5921622       2.0309780         1.80       0.59241622       2.0309780         1.90       0.6324376       2.06278785         1.90       0.6324376       2.0674045         2.00       0.63436937       2.99273346         2.00       0.	TARLE B DRUGT	<u> </u>	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	PARAMETERS	ECCENTRICITY	EIGENFREQUENCY
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.00	0,00000000	1,8411838
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	0.10	0.16937246	1,8535189
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	0.20	0.23629806	1.8655918
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.50	0.20369233	1.8774147
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.50	0.35944292	1.9003552
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.60	0.38804995	1,0114032
$\begin{array}{c} 0.80 & 0.43341242 & 1.9331508 \\ 0.90 & 0.45092878 & 1.9436871 \\ 1.00 & 0.47941562 & 1.9540387 \\ 1.10 & 0.4974308 & 1.9642127 \\ 1.20 & 0.51392315 & 1.974058 \\ 1.30 & 0.52972593 & 1.9840545 \\ 1.40 & 0.54369037 & 1.9937346 \\ 1.60 & 0.56974693 & 2.0126416 \\ 1.60 & 0.56974693 & 2.0126416 \\ 1.70 & 0.58161822 & 2.0019780 \\ 1.80 & 0.59281622 & 2.0399780 \\ 1.90 & 0.67326162 & 2.0399443 \\ 2.00 & 0.61342876 & 2.0467817 \\ 2.10 & 0.62204324 & 2.0574045 \\ 2.20 & 0.661342876 & 2.0467817 \\ 2.10 & 0.66210863 & 2.066085 \\ 2.60 & 0.66412438 & 2.0993184 \\ 2.70 & 0.67315286 & 2.1152087 \\ 2.90 & 0.663255 & 2.1231405 \\ 3.50 & 0.74735286 & 2.1152087 \\ 2.90 & 0.66412638 & 2.093184 \\ 2.70 & 0.67315286 & 2.1152087 \\ 2.90 & 0.6647555 & 2.1231405 \\ 3.50 & 0.77973611 & 2.2017635 \\ 4.00 & 0.77973611 & 2.2017635 \\ 4.50 & 0.6785502 & 2.323892 \\ 6.50 & 0.681913877 & 2.3569397 \\ 7.00 & 0.80765502 & 2.32389197 \\ 7.00 & 0.80765502 & 2.3359197 \\ 7.00 & 0.80960210 & 2.668507 \\ 13.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.69507243 & 2.629056 \\ 13.00 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.909019061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.90919061 & 2.7025521 \\ 15.50 & 0.905033 & 3.0916437 \\ 2.900 & 0.9537048 & 3.0916437 \\ 2.900 & 0.9537048 & 3.0916437 \\ 2.900 & 0.9537048 & 3.0916437 \\ 2.900 & 0.9537048 & 3.0916437 \\ 2.900 & 0.95414781 & 3.1144025 \\ \hline \end{array}$	0.70	0.41511274	1.9224222
$\begin{array}{c} 0, 0 \\ 0, 0 \\ 1, 0 \\ 1, 0 \\ 0 \\ 0, 47943562 \\ 1, 9540387 \\ 1, 10 \\ 0, 51392315 \\ 1, 9642127 \\ 1, 20 \\ 0, 51392315 \\ 1, 9742158 \\ 1, 9937346 \\ 1, 40 \\ 0, 54369037 \\ 1, 9937346 \\ 1, 60 \\ 0, 54369037 \\ 1, 9937346 \\ 1, 60 \\ 0, 54369037 \\ 1, 9937346 \\ 1, 70 \\ 0, 58416322 \\ 2, 0019785 \\ 1, 80 \\ 0, 59281622 \\ 2, 0019785 \\ 1, 80 \\ 0, 59281622 \\ 2, 0019785 \\ 1, 80 \\ 0, 59281622 \\ 2, 0019785 \\ 1, 80 \\ 0, 59281622 \\ 2, 0019785 \\ 1, 80 \\ 0, 59281622 \\ 2, 0019785 \\ 1, 80 \\ 0, 6642438 \\ 2, 00 \\ 0, 66442438 \\ 2, 0993184 \\ 2, 70 \\ 0, 66412438 \\ 2, 1073590 \\ 2, 80 \\ 0, 66412438 \\ 2, 1073590 \\ 2, 80 \\ 0, 66412438 \\ 2, 1073590 \\ 2, 80 \\ 0, 66412438 \\ 2, 1073590 \\ 2, 80 \\ 0, 66412438 \\ 2, 1073590 \\ 2, 80 \\ 0, 66412438 \\ 2, 1073590 \\ 2, 80 \\ 0, 66412438 \\ 2, 1073590 \\ 2, 80 \\ 0, 664135210 \\ 2, 1308869 \\ 3, 50 \\ 0, 74261606 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 7626106 \\ 2, 2371885 \\ 5, 50 \\ 0, 762610 \\ 2, 2996642 \\ 0, 2, 2996642 \\ 0, 2, 299676 \\ 1, 2, 2996642 \\ 0, 2, 299675 \\ 3, 2, 6670923 \\ 1, 20 \\ 0, 9029593 \\ 2, 6670923 \\ 2, 6670923 \\ 1, 00 \\ 0, 9029593 \\ 2, 6670923 \\ 1, 00 \\ 0, 9029593 \\ 2, 6670923 \\ 1, 00 \\ 0, 9029593 \\ 2, 6670923 \\ 1, 00 \\ 0, 9029593 \\ 2, 6670923 \\ 1, 00 \\ 0, 9029593 \\ 2, 6670923 \\ 1, 00 \\ 0, 9029593 \\ 2, 6670923 \\ 1, 00 \\ 0, 9029593 \\ 2, 6670923 \\ 1, 00 \\ 0, 9029593 \\ 2, 6670923 \\ 1, 00 \\ 0, 9029593 \\ 2, 6670923 \\ 1, 00 \\ 0, 9029593 \\ 2, 6670923 \\ 1, 00 \\ 0, 9029593 \\ 2, 6670923 \\ 2, 6670923 \\ 1, 00 \\ 0, 9029593 \\ 2, 6670923 \\ 2, 6670923 \\ 1, 00 $	0.80	0.43361242	1.9331508
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	<u> </u>	0.45992878	1.9436871
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1.10	0 49734308	1.9540307
1.30       0.52932593       1.9840545         1.40       0.54369037       1.9937346         1.60       0.56974693       2.0126416         1.70       0.58161822       2.0309780         1.80       0.59281622       2.0309780         1.90       0.6320199       2.04267817         2.10       0.63204324       2.0574945         2.20       0.63103603       2.0660865         2.20       0.63193603       2.0993184         2.70       0.6715286       2.1152987         2.80       0.67315286       2.1152987         2.90       0.6843455       2.3318869         3.50       0.7192057       2.1632766         4.00       0.7793611       2.2091642         5.50       0.76241606       2.2371885         5.00       0.762416023       2.2996642         6.50       0.81913877       2.3569397         7.00       0.82957243       2.629626         12.00       0.899732       2.68892         6.50       0.9029593       2.6670923         2.00       0.82957243       2.629626         13.00       0.89960210       2.6486101         13.50       0.9029593	1.20	0.51392315	1.9742158
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	1.30	0.52932593	1.9840545
1.60       0.56974693       2.0126414         1.70       0.58161822       2.0218785         1.80       0.59281622       2.0399780         1.90       0.67360199       2.0399443         2.00       0.61342876       2.0467817         2.10       0.62204324       2.0574045         7.20       0.63193663       2.0660865         2.60       0.66412438       2.0993184         2.70       0.67128930       2.1073590         2.80       0.6715286       2.131405         3.00       0.66415216       2.1318869         3.50       0.7762460       2.2371885         5.00       0.76241606       2.2371885         5.00       0.76241606       2.2371885         5.00       0.762461023       2.2691442         5.50       0.762461023       2.2691442         5.50       0.762461023       2.2691442         5.50       0.762461023       2.2691442         5.50       0.762461023       2.2691442         5.50       0.762461023       2.269142         5.50       0.7624532       2.3839197         12.00       0.86960210       2.6486101         13.50       0.9029593 </td <td>1.40</td> <td>0.54369037</td> <td>1.9937346</td>	1.40	0.54369037	1.9937346
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1,60	0.56974693	2.0126414
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1.70	0.58161822	
2.00       0.01342376       2.0374945         2.10       0.62294324       2.0574945         2.20       0.63193663       2.0660365         2.60       0.66412438       2.0993184         2.70       0.67128930       2.1073590         2.80       0.67315236       2.1152987         2.90       0.68473455       2.1231405         3.00       0.67105210       2.1308869         3.50       0.71920057       2.1632766         4.09       0.74308271       2.2017635         4.50       0.76241666       2.2371885         5.00       0.702611023       2.2996642         5.50       0.702461023       2.2996642         6.00       0.80765502       2.3288892         6.50       0.81913877       2.3569397         7.00       0.82945932       2.3839197         12.00       0.39203191       2.64206256         13.00       0.89960210       2.6486101         13.50       0.90299593       2.6670923         14.00       0.90199632       2.7198786         2.50       0.90199632       2.7198786         2.50       0.90199633       3.0572038         2.750       0.9050	1.00	0.29281022	2.0307704 2.0307704
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.00	0.61342876	2.0487817
2,20 $0,63103663$ $2,0660365$ $2,60$ $0,67128930$ $2,1073590$ $2,70$ $0,67128930$ $2,1073590$ $2,80$ $0,67315236$ $2,1152987$ $2,90$ $0,68473655$ $2,1231405$ $3,00$ $0,69105210$ $2,1308869$ $3,50$ $0,7492057$ $2,1632766$ $4,09$ $0,74303271$ $2,2017635$ $4,50$ $0,77973611$ $2,2691442$ $5,50$ $0,76241606$ $2,2371885$ $5,00$ $0,77973611$ $2,2691442$ $5,50$ $0,76245922$ $2,383992$ $6,50$ $0,80765502$ $2,328892$ $6,50$ $0,80765922$ $2,3839197$ $12,00$ $0,82945932$ $2,3839197$ $12,00$ $0,8960210$ $2,6486101$ $13,50$ $0,9029593$ $2,6670223$ $14,00$ $0,9029593$ $2,6851650$ $14,50$ $0,9029593$ $2,6851650$ $14,50$ $0,9029593$ $2,6851650$ $14,50$ $0,9029593$ $2,6851650$ $14,50$ $0,9029503$ $3,0672938$ $27,50$ $0,96328453$ $3,0689633$ $27,50$ $0,95376436$ $3,0916437$ $27,00$ $0,9537038$ $3,0916437$ $27,00$ $0,9547431$ $3,1144025$	2.10	0.62204324	2,0574045
2,60 $0,66412438$ $2,0993184$ $2,70$ $0,67128930$ $2,1073590$ $2,80$ $0,67315286$ $2,103590$ $2,90$ $0,68473455$ $2,1231405$ $3,00$ $0,66473455$ $2,1231405$ $3,00$ $0,66473455$ $2,1231405$ $3,00$ $0,66473457$ $2,1682766$ $4,00$ $0,74308271$ $2,2017635$ $4,50$ $0,76241606$ $2,2371885$ $5,00$ $0,76241606$ $2,2371885$ $5,00$ $0,77973611$ $2,2691442$ $5,50$ $0,77441023$ $2,2996642$ $6,50$ $0,8076502$ $2,3288892$ $6,50$ $0,81913877$ $2,3569397$ $7,00$ $0,82945932$ $2,3889197$ $12,00$ $0,82945932$ $2,3889197$ $12,00$ $0,89960210$ $2,6486101$ $13,50$ $0,9029593$ $2,6670923$ $14,00$ $0,9029593$ $2,6851650$ $14,50$ $0,9029593$ $2,6871650$ $14,50$ $0,902919061$ $2,7025521$ $15,00$ $0,940919766$ $3,0572938$ $27,50$ $0,95084845$ $3,6689683$ $28,00$ $0,95170987$ $3,0806534$ $28,50$ $0,95257038$ $3,0916437$ $20,00$ $0,95414781$ $3,1144025$	2.20	0.63193663	2,0660865
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.60	0.66412438	2.0993184
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.70	0.67128930	2.10/3590
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2,09	0.0/012/05	2 122907
3.50 $0.71920957$ $2.1632766$ $4.09$ $0.74303271$ $2.2017635$ $4.50$ $0.76241606$ $2.2371885$ $5.00$ $0.77973611$ $2.2691442$ $5.50$ $0.7973611$ $2.2691442$ $5.50$ $0.79461023$ $2.2996642$ $6.00$ $0.80765502$ $2.3288892$ $6.50$ $0.81913877$ $2.3569397$ $7.00$ $0.82945932$ $2.3839197$ $12.00$ $0.89203191$ $2.6103241$ $12.50$ $0.69597243$ $2.6296956$ $13.00$ $0.89960210$ $2.6486101$ $13.50$ $0.9029993$ $2.6670923$ $14.00$ $0.90617532$ $2.6851650$ $14.00$ $0.904919061$ $2.7025521$ $15.00$ $0.94901976$ $3.0454551$ $27.00$ $0.94901976$ $3.0454551$ $27.00$ $0.95170987$ $3.0806534$ $28.50$ $0.9557038$ $3.0916437$ $29.00$ $0.955414781$ $3.1144025$	3.00	0.69105210	2.1308869
4.00 $0.74308271$ $2.2017635$ $4.50$ $0.76261606$ $2.2371885$ $5.00$ $0.77973611$ $2.2691442$ $5.50$ $0.79461023$ $2.2996642$ $6.00$ $0.80765502$ $2.3288892$ $6.50$ $0.81913877$ $2.3569397$ $7.00$ $0.82945932$ $2.3839197$ $12.00$ $0.9208191$ $2.6403241$ $12.50$ $0.69507243$ $2.6296956$ $13.00$ $0.89960210$ $2.6486101$ $13.50$ $0.90299593$ $2.6670923$ $14.00$ $0.99019061$ $2.7025521$ $15.00$ $0.91199632$ $2.7198786$ $26.50$ $0.94001976$ $3.0454551$ $27.50$ $0.95170987$ $3.0806534$ $28.00$ $0.95170987$ $3.0806534$ $28.00$ $0.95336406$ $3.1032460$ $29.50$ $0.95414731$ $3.1144025$	3.50	0.71920057	2.1682766
4.50 $0.76241606$ $2.2371885$ $5.00$ $0.77973611$ $2.2691442$ $5.50$ $0.79461023$ $2.2996642$ $6.00$ $0.80765502$ $2.328892$ $6.50$ $0.81913877$ $2.3569397$ $7.00$ $0.82945932$ $2.3839197$ $12.00$ $0.39203191$ $2.6403241$ $12.50$ $0.69507243$ $2.64296956$ $13.00$ $0.89960210$ $2.6486101$ $13.50$ $0.9029593$ $2.6670923$ $14.00$ $0.90617532$ $2.7025521$ $15.00$ $0.91199632$ $2.7198786$ $26.50$ $0.94001976$ $3.0454551$ $27.00$ $0.95170987$ $3.0806534$ $28.50$ $0.9527038$ $3.0916437$ $29.50$ $0.95414731$ $3.1144025$	4.00	0.74308271	2.2017635
5.00 $0.77973611$ $2.2691442$ 5.50 $0.79461923$ $2.2996642$ 6.00 $0.80765502$ $2.3288892$ 6.50 $0.81913877$ $2.3569397$ 7.00 $0.82945932$ $2.3839197$ 12.00 $0.39203191$ $2.6103241$ 12.50 $0.69597243$ $2.6296956$ 13.00 $0.86960210$ $2.6486101$ 13.50 $0.9029593$ $2.6670923$ 14.00 $0.90617532$ $2.6851650$ 14.50 $0.90919061$ $2.7025521$ 15.00 $0.94001976$ $3.0454551$ 27.00 $0.94001976$ $3.0689683$ 28.00 $0.95170987$ $3.0806534$ 28.50 $0.95336406$ $3.1032460$ 29.50 $0.95414781$ $3.1144025$	4.50	0.76261606	2.2371885
3.39 $0.75461923$ $2.2990642$ $6.00$ $0.80765502$ $2.3288892$ $6.50$ $0.81913877$ $2.3569397$ $7.00$ $0.82945932$ $2.3839197$ $12.00$ $0.39203191$ $2.6103241$ $12.50$ $0.69507243$ $2.6296956$ $13.00$ $0.89960210$ $2.6486101$ $13.50$ $0.90299593$ $2.6670923$ $14.00$ $0.90617532$ $2.6851650$ $14.50$ $0.90919061$ $2.7025521$ $15.00$ $0.91109632$ $2.7198786$ $26.50$ $0.94001976$ $3.0454551$ $27.00$ $0.95084845$ $3.0689683$ $27.50$ $0.95170987$ $3.0806534$ $23.50$ $0.95336406$ $3.1032460$ $29.50$ $0.95414781$ $3.1144025$	5,00		2.2691442
6.50 $0.81913877$ $2.3569397$ $7.00$ $0.82945932$ $2.3839197$ $12.00$ $0.39203191$ $2.6103241$ $12.50$ $0.69507243$ $2.6296956$ $13.00$ $0.89960210$ $2.6486101$ $13.50$ $0.90299593$ $2.6670923$ $14.00$ $0.90617532$ $2.6851650$ $14.50$ $0.90299593$ $2.6670923$ $14.00$ $0.90179061$ $2.7025521$ $15.00$ $0.91199632$ $2.7198786$ $26.50$ $0.94001976$ $3.0454551$ $27.00$ $0.95084845$ $3.0689883$ $23.00$ $0.95170987$ $3.0806534$ $23.50$ $0.95257038$ $3.0916437$ $29.00$ $0.95414781$ $3.1144025$		0.79461923	2,2990042
7.00 $0.82945932$ $2.3839197$ 12.00 $0.39203191$ $2.6103241$ 12.50 $0.69597243$ $2.6296956$ 13.00 $0.89960210$ $2.6486101$ 13.50 $0.90299593$ $2.6670923$ 14.00 $0.90617532$ $2.6851650$ 14.50 $0.90219061$ $2.7025521$ 15.00 $0.91199632$ $2.7198786$ 26.50 $0.94901976$ $3.0454551$ 27.00 $0.95084845$ $3.0689683$ 28.00 $0.95170987$ $3.0806534$ 28.50 $0.95257038$ $3.0916437$ 29.00 $0.95414781$ $3.1144025$	6 50	0.81918877	2 3569397
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	7.00	0.82945932	2,3839197
12.50 $0.69597243$ $2.6296956$ $13.00$ $0.89960210$ $2.6486101$ $13.50$ $0.90299593$ $2.6670923$ $14.00$ $0.90617532$ $2.6851650$ $14.50$ $0.90919061$ $2.7025521$ $15.00$ $0.91199632$ $2.7198786$ $26.50$ $0.94901976$ $3.0454551$ $27.00$ $0.95084845$ $3.0689883$ $27.50$ $0.95170987$ $3.0806534$ $28.50$ $0.95257038$ $3.0916437$ $29.50$ $0.95414781$ $3.1144025$	12.00	0.89208191	2.6103241
13.00 $0.89960210$ $2.6486101$ $13.50$ $0.90299593$ $2.6670923$ $14.00$ $0.90617532$ $2.6851650$ $14.50$ $0.90919061$ $2.7025521$ $15.00$ $0.91199632$ $2.7198786$ $26.50$ $0.94901976$ $3.0454551$ $27.00$ $0.94901976$ $3.0572938$ $27.50$ $0.95084845$ $3.0689683$ $28.00$ $0.95170987$ $3.0806534$ $28.50$ $0.95257038$ $3.0916437$ $29.00$ $0.95414781$ $3.1144025$	12.50	0.89597243	2.6296956
13.50 $0.90209593$ $2.6670925$ $14.00$ $0.90617532$ $2.6851650$ $14.50$ $0.90919061$ $2.7025521$ $15.00$ $0.91199632$ $2.7198786$ $26.50$ $0.94901976$ $3.0454551$ $27.00$ $0.94905033$ $3.0572938$ $27.50$ $0.95084845$ $3.0689683$ $28.00$ $0.95170987$ $3.0806534$ $28.50$ $0.95257038$ $3.0916437$ $29.00$ $0.95336406$ $3.1032460$ $29.50$ $0.95414781$ $3.1144025$	13.00	0.89960210	2.6486101
14.00 $0.70017332$ $2.0631630$ $14.50$ $0.90919061$ $2.7025521$ $15.00$ $0.91199632$ $2.7198786$ $26.50$ $0.94901976$ $3.0454551$ $27.00$ $0.94905033$ $3.0572938$ $27.50$ $0.95084845$ $3.0689883$ $28.00$ $0.95170987$ $3.0806534$ $28.50$ $0.95257038$ $3.0916437$ $29.00$ $0.95414781$ $3.1032460$	13.50	0,90299393	6.6670945
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	14.50		2 7025521
26.50       0.94901976       3.0454551         27.00       0.94905033       3.0572938         27.50       0.95084845       3.0689683         28.00       0.95170987       3.0806534         28.50       0.95257038       3.0916437         29.00       0.95336406       3.1032460         29.50       0.95414781       3.1144025	15.00	0.91199632	2.7198786
27.00       0.94005033       3.0572938         27.50       0.95084845       3.0689683         28.00       0.95170987       3.0806534         28.50       0.95257038       3.0916437         29.00       0.95336406       3.1032400         29.50       0.95414781       3.1144025	26.50	0.94901976	3,0454551
27.50       0.95084845       3.0689883         28.00       0.95170987       3.0806534         28.50       0.95257038       3.0916437         29.00       0.95336406       3.1032460         29.50       0.95414781       3.1144025	27.00	0.94905033	3.0572938
23.00       0.95170987       3.0806534         23.50       0.95257038       3.0916437         29.00       0.95336406       3.1032460         29.50       0.95414781       3.1144025	27.50	0.95084845	3.0689683
29.00     0.95257038     3.0918437       29.00     0.95336406     3.1032460       20.50     0.95414781     3.1144025	28.00	0.95170987	3.0806534
<b>2</b> 9.50 0.95414781 3.1144025	20.00	0.90257938	3,0910437
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.00 0.10 0.20 0.30 0.40 0.50 1.00 1.50 2.00	0.0000000 0.10325981 0.14563855 0.17788860 0.20485130 0.22840909 0.31861749	3.0542369 3.0542514 3.0542948 3.0543672 3.0544684 3.0545985	· · · · · ·
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.10 0.20 0.30 0.40 0.50 1.00 1.50 2.00	0.10325981 0.14563855 0.17788860 0.20485130 0.22840909 0.31861749	3,0542514 3,0542948 3,0543672 3,0544684 3,0545985	······································
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.20 0.30 0.40 0.50 1.00 1.50 2.00	0.14563855 0.17783860 0.20485130 0.22840909 0.31861749	3.0542948 3.0543672 3.0544684 3.0545985	······
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.30 0.40 0.50 1.00 1.50 2.00	0.17783860 0.20485130 0.22840909 0.31861749	3.0543672 3.0544684 3.0545985	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c} 0.40\\ 0.50\\ \hline 1.00\\ 1.50\\ \hline 2.00\\ \end{array} $	0.20485130 0.22840909 0.31861749	3.0544684	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1.00 1.50 2.00	0.31861749	3,1343903	
1.500.384840093.05747022.000.438180333.05795252.500.483018443.06310363.000.521647593.06689523.500.555462293.07129454.000.585395153.0762657 $4.50$ 0.612112493.08177065.000.656113913.08776945.500.657787993.09422196.000.657787993.09422196.000.714684403.11590737.000.714684403.11590737.500.72665293.12378608.000.740405083.13193139.500.725649913.157658910.000.785561093.166573810.000.83501893.184770811.000.803501893.184770812.000.819077693.20327712.500.826107623.212699514.500.803501893.1344338720.000.89549673.3530321.500.896408503.371772822.000.904208533.3900264	1.50	(), 3 ( () ( ) ( · · · · ·	5 0556798	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2 00	0.38484009	3.0574702	
2.50 $0.48301844$ $3.0631036$ 3.00 $0.52164759$ $3.0668952$ 3.50 $0.55546229$ $3.0712945$ 4.00 $0.58539515$ $3.0762657$ 4.50 $0.61211249$ $3.0817706$ 5.00 $0.63611391$ $3.0877694$ 5.50 $0.65778799$ $3.0942219$ $6.00$ $0.67744551$ $3.1010883$ $6.50$ $0.67744551$ $3.1010883$ $6.50$ $0.69534053$ $3.1083294$ $7.00$ $0.71168440$ $3.1159073$ $7.50$ $0.72665529$ $3.1237860$ $8.00$ $0.74040508$ $3.1319313$ $9.50$ $0.77556109$ $3.1665738$ $10.50$ $0.79485603$ $3.1756181$ $11.00$ $0.80350189$ $3.1847708$ $11.59$ $0.81155815$ $3.1940130$ $12.00$ $0.82610762$ $3.203277$ $12.50$ $0.32610762$ $3.2126095$ $15.50$ $0.89054931$ $3.3443387$ $20.00$ $0.89913535$ $3.3717728$ $21.50$ $0.89013535$ $3.3900264$		0.43818033	3.0599525	
3.00 $0.52164759$ $3.0668952$ $3.50$ $0.55546229$ $3.0712945$ $4.00$ $0.53539515$ $3.0762657$ $4.50$ $0.61211249$ $3.0817706$ $5.00$ $0.63611391$ $3.0877694$ $5.50$ $0.65778799$ $3.0942219$ $6.00$ $0.67744551$ $3.1010883$ $6.50$ $0.69534053$ $3.1083294$ $7.09$ $0.71168440$ $3.1159073$ $7.50$ $0.72665529$ $3.1237860$ $8.00$ $0.74040508$ $3.1319313$ $9.50$ $0.7754991$ $3.1665738$ $10.00$ $0.78556109$ $3.1665738$ $10.50$ $0.79485603$ $3.1756181$ $11.00$ $0.80350189$ $3.1847708$ $11.59$ $0.81155815$ $3.1940130$ $12.00$ $0.82610762$ $3.203277$ $12.50$ $0.32610769$ $3.3626755$ $10.50$ $0.89913535$ $3.3717728$ $21.50$ $0.89913535$ $3.3900264$	2.50	0.48301844	3,0631036	
3.50 $0.55546229$ $3.0712945$ $4.00$ $0.58539515$ $3.0762657$ $4.50$ $0.61211249$ $3.0817706$ $5.00$ $0.63611391$ $3.0877694$ $5.50$ $0.65778799$ $3.0942219$ $6.00$ $0.67744551$ $3.1010883$ $6.50$ $0.69534053$ $3.1083294$ $7.00$ $0.71168440$ $3.1159073$ $7.50$ $0.72665529$ $3.1237860$ $8.00$ $0.74040508$ $3.1319313$ $9.50$ $0.77554991$ $3.1665738$ $10.50$ $0.79485603$ $3.1847708$ $11.52$ $0.81155815$ $3.1940130$ $12.00$ $0.81907769$ $3.203277$ $12.50$ $0.82610702$ $3.2126995$ $10.00$ $0.8954931$ $3.3443387$ $20.00$ $0.89913535$ $3.3717728$ $21.50$ $0.89913535$ $3.3717728$ $21.50$ $0.99420853$ $3.3900264$	3.00	0.52164759	3.0668952	
$4.00$ $0.53539515$ $3.0762657$ $\lambda.50$ $0.61211249$ $3.0817706$ $5.00$ $0.63611391$ $3.0877694$ $5.50$ $0.65778799$ $3.0942219$ $6.00$ $0.65774551$ $3.1010883$ $6.50$ $0.69534053$ $3.1083294$ $7.00$ $0.71168440$ $3.1159073$ $7.50$ $0.72665529$ $3.1237860$ $8.00$ $0.74040508$ $3.1319313$ $9.50$ $0.77554991$ $3.1576589$ $10.00$ $0.78556109$ $3.1665738$ $10.50$ $0.79485603$ $3.1756181$ $11.50$ $0.8155815$ $3.1940130$ $12.00$ $0.81907769$ $3.203277$ $12.50$ $0.32610702$ $3.2126995$ $12.50$ $0.82954951$ $3.3443387$ $20.00$ $0.89913535$ $3.3717728$ $21.50$ $0.89913535$ $3.3900264$	3.50	0.55546229	3.0712945	
2.50 $0.61211249$ $5.0817706$ $5.00$ $0.63611391$ $3.0877694$ $5.50$ $0.65778799$ $3.0942219$ $6.00$ $0.67744551$ $3.1010883$ $6.50$ $0.69534053$ $3.1083294$ $7.00$ $0.71168440$ $3.1159073$ $7.50$ $0.72665529$ $3.1237860$ $8.00$ $0.74040508$ $3.139313$ $9.50$ $0.77554991$ $3.1665738$ $10.00$ $0.78556109$ $3.1665738$ $10.50$ $0.79485603$ $3.1756181$ $11.00$ $0.80350189$ $3.1847708$ $11.52$ $0.81155815$ $3.1940130$ $12.00$ $0.82610762$ $3.203277$ $12.50$ $0.82610762$ $3.243387$ $20.00$ $0.89913535$ $3.3717728$ $21.50$ $0.89913535$ $3.3900264$	4.00	0.58539515	3,0762627	
5.00 $0.03611391$ $3.007724$ $5.50$ $0.65778799$ $3.0942219$ $6.00$ $0.67744551$ $3.1010883$ $6.50$ $0.69534053$ $3.1010883$ $7.00$ $0.71168440$ $3.1159073$ $7.50$ $0.72665529$ $3.1237860$ $8.00$ $0.74040508$ $3.1319313$ $9.50$ $0.77554991$ $3.1576589$ $10.00$ $0.78556109$ $3.1665738$ $10.50$ $0.79485603$ $3.1756181$ $11.00$ $0.80350189$ $3.1847708$ $11.52$ $0.81155815$ $3.1940130$ $12.00$ $0.81907769$ $3.203277$ $12.50$ $0.82610702$ $3.2426995$ $10.50$ $0.89054951$ $3.3443387$ $20.00$ $0.8913535$ $3.3717728$ $21.50$ $0.90173852$ $3.3808207$ $22.00$ $0.90173852$ $3.3900264$	4.20	0.01211249	5,0817700 7,0977207	
6.00 $0.67744551$ $3.1010883$ $6.50$ $0.69534053$ $3.1083294$ $7.00$ $0.71168440$ $3.1159073$ $7.50$ $0.72665529$ $3.1237860$ $8.00$ $0.74040508$ $3.1319313$ $9.50$ $0.77554991$ $3.1576589$ $10.00$ $0.78556109$ $3.1665738$ $10.50$ $0.79485603$ $3.1756181$ $11.00$ $0.80350189$ $3.1847708$ $11.57$ $0.81155815$ $3.1940130$ $12.00$ $0.81907769$ $3.2033277$ $12.50$ $0.2610762$ $3.2126995$ $10.50$ $0.8954931$ $3.3443387$ $20.00$ $0.89913535$ $3.3717728$ $21.50$ $0.90173852$ $3.3808207$ $22.00$ $0.90420853$ $3.900264$	5.00	0.65778709	3,0877874	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	6.00	0.67744551	3,1010883	
7.00 $0.71168440$ $3.1159073$ $7.50$ $0.72665529$ $3.1237860$ $8.00$ $0.74040508$ $3.1319313$ $9.50$ $0.77554991$ $3.1576589$ $10.00$ $0.78556109$ $3.1665738$ $10.50$ $0.79485603$ $3.1756181$ $11.00$ $0.80350189$ $3.1847708$ $11.59$ $0.81155815$ $3.1940130$ $12.00$ $0.81907769$ $3.2033277$ $12.50$ $0.32610762$ $3.2126995$ $10.50$ $0.89054931$ $3.3443387$ $20.00$ $0.89354967$ $3.3535303$ $20.50$ $0.8913535$ $3.717728$ $21.50$ $0.90173852$ $3.3808207$ $22.00$ $0.90420853$ $3.900264$	6.50	0.69534053	3.1083294	****
7.50 $0.72665529$ $3.1237860$ 8.00 $0.74040508$ $3.1319313$ 9.50 $0.77554991$ $3.1576589$ 10.00 $0.78556109$ $3.1665738$ 10.50 $0.79485603$ $3.1756181$ 11.00 $0.80350189$ $3.1847708$ 11.50 $0.81155815$ $3.1940130$ 12.00 $0.81907769$ $3.2033277$ 12.50 $0.62610702$ $3.2126995$ 10.50 $0.82610702$ $3.3535303$ 20.00 $0.89354967$ $3.3626755$ 21.00 $0.89913535$ $3.3717728$ 21.50 $0.90173852$ $3.3808207$ 22.00 $0.90420853$ $3.3900264$	7.00	0.71168440	3.1159073	
8.00 $0.74040508$ $3.1319313$ $9.50$ $0.77554991$ $3.1576589$ $10.00$ $0.78556109$ $3.1665738$ $10.50$ $0.79485603$ $3.1756181$ $11.00$ $0.80350189$ $3.1847708$ $11.50$ $0.81155815$ $3.1940130$ $12.00$ $0.81907769$ $3.2033277$ $12.50$ $0.82610762$ $3.2126995$ $10.50$ $0.89054961$ $3.3443387$ $20.00$ $0.89913535$ $3.3717728$ $21.50$ $0.90173852$ $3.3808207$ $22.00$ $0.90420853$ $3.3900264$	7,50	0.72665529	3.1237860	
9.50 $0.77554991$ $3.1576589$ $10.00$ $0.78556109$ $3.1665738$ $10.50$ $0.79485603$ $3.1756181$ $11.00$ $0.80350189$ $3.1847708$ $11.50$ $0.81155815$ $3.1940130$ $12.00$ $0.81907769$ $3.2033277$ $12.50$ $0.32610762$ $3.2126995$ $10.50$ $0.89354967$ $3.3535303$ $20.00$ $0.89354967$ $3.3626755$ $21.00$ $0.89913535$ $3.3717728$ $21.50$ $0.90173852$ $3.3808207$ $22.00$ $0.90420853$ $3.900264$	8.00	0.74040508	3.1319313	
16.00 $0.78556109$ $3.1665738$ $10.50$ $0.79485603$ $3.1756181$ $11.00$ $0.80350189$ $3.1847708$ $11.50$ $0.81155815$ $3.1940130$ $12.00$ $0.81907769$ $3.2033277$ $12.50$ $0.82610762$ $3.2126995$ $10.50$ $0.82610762$ $3.3443387$ $20.00$ $0.89054931$ $3.3443387$ $20.00$ $0.89640850$ $3.3626755$ $21.00$ $0.89913535$ $3.3717728$ $21.50$ $0.90173852$ $3.3808207$ $22.00$ $0.90420853$ $3.3900264$	9.50	0.77554991	3.1576589	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		0.78556109	3.1665/38	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		0.79482003	2,7/20101 3 49/7208	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	11.50		3 1040130	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	12.00	0.81907769	3.2033277	
10.50       0.89054931       3.3443387         20.00       0.89354967       3.3535303         20.50       0.89640850       3.3626755         21.00       0.89913535       3.3717728         21.50       0.90173852       3.3808207         22.00       0.90420853       3.3900264	12.50	0.82610702	3.2126995	
20.00       0.89354967       3.3535303         20.50       0.89640850       3.3626755         21.00       0.89913535       3.3717728         21.50       0.90173852       3.3808207         22.00       0.90420853       3.3900264	10.50	0.89054931	3,3443387	 ~
20.50         0.89640850         3.3626755           21.00         0.89913535         3.3717728           21.50         0.90173852         3.3808207           22.00         0.90420853         3.3900264	20.00	0.89354967	3.3535303	
21.00         0.89913535         3.3717728           21.50         0.90173852         3.3808207           22.00         0.90420853         3.3900264	20.50	0.89640850	3.3626755	
<b>22</b> .00 0.90173052 5.3808207 <b>22</b> .00 0.90420853 3.3900264	21.00		3.3717728	
E2.00 0.704/0000 3.3400/04	22 00	0,90173032	5.3808707	
- Z2 S0	22 50	0.30420033	3,39,0204	
38,50 0.94964230 3,6574258	38.50	0.94964230	3.6574258	
30.00 0.95039531 3.6647078	30.00	0.95039531	3.6647078	
39.50 0.95112788 3.6719467	39.59	0.95112788	3.6719467	i
40.00 0.95184078 3.6791428	40.00	0.95184078	3.6791428	
40.50 0.95253476 3.6862966	40.50	0.95253476	3.6862966	
41,00 <u>0.95321954</u> <u>3.6934088</u>	41.00	0.95321954	3,6934088	

1	<u>/r.K</u>		
PARAMETER	ECCENTRICITY	EIGENFRFQUENCY	
Δ · 0 0 ·····	<u> </u>	4- 2011889	
0.50	0.16713231		
1.00	0.23473138	4.2002530	<b></b>
1.50	0.28352961	4.1991467	
2.00	0.32748375	4.1976695	
2.50	0.36370066	4,1958605	
3,00	0.59578243	4.195/5/3	
<u> </u>	0.42407702	<u> </u>	
4.50	0.47533190	4,1860354	
5.00	0.49781421	4,1831005	
5.50	0,51875750	4,1800363	
6.00	0.53335188	4.1768712	
6.50	0.55674918	4.1736319	
7.00	0.27407306	4.1703437	
8 00	0.09042394	4,1070302	
8.50	0.000000	4.1604168	· · · · · · · · ·
9.00	0.63445775	4.1571564	
9.50	0.64767171	4,1539515	
10.50	0.67220604	4.1477725	
11.00	0.68360735	4.1448271	
11.50	0.09447853	4,1419947	
12.00	<u>0.71/95227</u>	4,1376004	
13 00	0.71472637	4,1307170	
13.50	0.73324600	4,1319967	
16.50	0.77977776	4.1217141	
17.00	0.78641605	4.1205947	
17.50	0.79277602	4.1196472	
18.00	0.79887108	4.1188711	
18.50	0.00471371	4.1182048	
10.50	0.01031037	<u> </u>	·
30.50	0.39320698	4,1460359	
31,00	0.89545334	4.1485249	
31.50	0.89762468	4,1510875	
32.00.	0.89972420	4.1537204	· · · · · · · · · · · · · · · · · · ·
32.50	0.90175493	4.1564206	
<u>53,00</u> 7- 50		4,1591850	
25.29 55.80	0.70562145	4.1660109	
22. JU	0.94826016	4,3207209	
53 00			
<b>5</b> 3.00 <b>5</b> 3.50	0,94886340	4.3311349	
<b>\$3.00</b> <b>\$3.50</b> <b>\$4.00</b>	0.94886340	4.3311329	
<b>53.00</b> <b>53.50</b> <b>54.00</b> <b>54.50</b>	0.94886340 0.94945273 0.95002859	<u>4.3311329</u> <u>4.3363681</u> <u>4.3416240</u>	
<b>\$3.00</b> <b>\$3.50</b> <b>\$4.00</b> <b>\$4.50</b> <b>\$5.00</b>	0.94886340 0.94945273 0.95002859 0.95059142	4.3311329 4.3363681 4.3416240 4.3468998	

PARAHETERS	ECCENTRICITY	EIGENFREQUENCY
0.00	<u> </u>	
6.50	0.13239212	5,3174442
1.00	0.13641616	5.3171177
1.50	0.22732738	5,3165742
2.00	0,2013/373	>.3158146
2.20 	0.29090715	5 2136526
		5 3122540
4.00	0.36349344	5,3106466
4.50	0.38396349	5,3088334
5.00	0.40308784	5.3068172
5.50	0.42105658	5.3046015
6.00	0,43801805	5.3021901
6.20	0.40409075	5,7993009
7.00	<u>0.46757110</u> <u>0.68703887</u>	5,297703
	0.40395007	5 2906717
3.50	0.51119404	5,2873476
9.00	0.52398678	5,2838561
°.\$0	0.53628118	5.2802028
11.00	0.57051893	5.2683313
11.50	0.58114487	5.2640910
12.00	0.59141(50	<b>2.25</b> 9/178
12.20	0.00155040	
12 50	0.01040000	5 2458883
-14.00	0.62934636	5,2410615.
17.00	0.07831970	5-2103250
17.50	0.68569730	5.2049734
18.00	0.69287336	5.1995754
18.50	0.69985505	5,1941382
19.00	0.70664995	5.1880608
19.50	0.71320104	5.1851(45
22 50	<u> </u>	5,1770014
27 00	0 79403693	5 1020694
27.50	0.79837552	5,0970048
28.00	0.80260220	5,0920097
28.50	0.80671933	5,0870877
20.00	0.81073119	5.0822424
29.50	0.81463900	5,0774770
44.30	0.37493703	4,9790747
45.90	0.07007310	4.9772064 10756188
46.00	0.01040018	4 0740225
46.50	0.90170813	4.9725122
47.00	0.90329937	4.9710865
47.50	0.90485230	4.9697438
70.50	0.94376537	4.9746814
71.00	0.94933284	4,9758103
71.50	0.94983940	4,9769683
72.00	0.93043281	4.9781547
72 00	0.73077230	4,9792007
77 50	0.9520165214	Δ 0818774
1.3 • # V		

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TARLE B ORDE	R 5		
PARAHETERS	ECCENTRICITY	EIGENFREQUENCY	
e.00	0.0000000	6.4156164	
1.00	0.15403138	6.4153340	
5.00	0.21789251	0.4146866	
3.00	0.30442770	6-4118949	
5.00	0.33840408	0.4097993	
6.00	0.36359593	6.4072364	
7.00	0.39589084	6,4042059	• • • • • • • • • •
8.00	0.4208/142	6,4007078	
10.00	0.46541129	6.3923113	
11.00	0.43549655	6.3874156	
12.00	0.50437863	6.3820579	
13.00	0.52219951	6,3762416	
14.00	0:25907490	6.3699707	• - 6 40 - 19 - 19 - 1 - 10 - 10 - 10 - 10 - 10
16.00	0.57035689	6.3560873	
17.00	0.58491194	0,3484882	r canan militar, yan s
18.00	0.59382408	6.3404617	
10,00	0.61214367	6.3320173	······································
21 00	0.02491455	6 31 301 80	rear Montone
24.00	0.67121201	6.2839429	
25.00	0.68173277	6.2732568	-
26.00	0.69187752	6.2622519	
27.00	0.70166591	6.2509467	
20.00	0.7111215	6 2275141	
30,00	0.72905699	6.2154280	
37.00	0.78306361	6.1260231	
38,00	0.78979024	6.1128508	
30.00	0.79629374	6,0996453	
40.00	0.00250021	6,0864334	· · · · · · · · · · · · · · · · · · ·
42.00	0.81452810	6.0600894	
43.00	0.82020157	6,0470001	
60.00	0.89135668	5.8508400	
61.00	0.87432242	<b>5.8415107</b>	
67.00		5 8237218	
64.00	0,90260132	5.8152511	
65.00	0.90516348	5.8070640	Part - 1991 - 1991 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 1995 - 19
66.00	0.90763273	5.7991593	
92,00	0.94886719	5.6794820	~ • <del>~</del> • • • • • •
93.00	0.94984143	5 6757674	
95.00	0.95171979	5.6741309	
96.00	0.95261411	5,6726369	
97.00	0.95348193	5,6712812	
98.00	0.95432426	5.6700596	
un - Marryalatatan undatatan undarganin yara danga mga di dalama undarata nyu dangan ya	an an ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '		

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TABLE B OR	VER 6		
PARAMETER	ECCENTRICITY	EIGENFREQUENCY	
n 00	<u> </u>	7 5012661	
1.00	0.13272230	7,5011267	
5.00	0.18687588	7,5007084	
3.00	0.22788138	7.5000109	
	0.20200134	7,4990341	·····
<u> </u>	0 31815943	7.4962406	
7.00	0.34220636	7.4944227	
8.00	0.36430767	7.4923232	
\$.00	0.33480703	7.4899413	
	0.40395604	(.48/2/01 7-10/7367	با این ایرون اندا بده مدارند این ۱۹۹۹ میروند.
12.00	0.42194208	7 / 81 0922	
13.00	0.45501351	7.4775716	
. 14.00	0.47030821	7.4737638	
15.00	0.48488969	7.4696679	
16.00	0,49882558	7,4652829	
	0.21217339	7.4500079	
10.00	0.53729567	7.4503847	<u>a de value d'anterior constanter a deservante</u> a des als als es e
<b>5</b> 5 00	0.57161189	7.4328569	e
- 23.00	0.58227384	7.4264278	
24.00	0.59258845	7,4197055	
<u> </u>	0.00257656	7.4126900	
27.00	0.61223102	7 3977212	angang manang manang manang kanang kanang manang
28.00	0.63076169	7.3898908	
34.00	0.68038793	7,3365358	
35.00	0.63791360	7.3266660	
36.00	0.09524905	7,3165265	
38.00	0 70038150	7 2054557	
39,00	0.71619052	7.2845349	•
40.00	0.72283741	7.2733435	
51.00	0.78647089	7.1361784	
<u>\$2,00</u>	0.79149056	7.1226400	
52.00	0.79639335	7,1089691	• •
55.00	0.80586960	7.0812766	-
56.00	0.81044344	7.0672791	
57.00	0.81401110	7,0531973	
81.00	0.89474471	6.7218998	
82.00	0.80709964	6.7095441	
83.00	0.09937013	6 4853975	
85.00	0.90378340	6.6736159	
86.00	0.90589021	6,6620339	
87.00	0.90793812	6.6506549	
100.00	0.92000056	6.5219259	
104.12	0.95534336	0,4885201	
118.15	0.24040474	6 2001205	· · · · · · · · · · · · · · · · · · ·
123.46	0.95408153	6 3738892	۰ - الد الدينية الد المالية (المالية) (المالية) (المالية) (المالية) (المالية) (المالية) (المالية) (المالية) (ا المالية (المالية) (الم
120.13	0.95801662	6.3513746	nan anna ann an an an ann an ann an an a
135.21	0.96166600	6,3318067	

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TABLE B ORDE	3 7		
PARANETER S	ECCENTRICITY	EIGENFREQUENCY	
- 0.00	0.0000000	8.5778365	
1.00	0.11618530	8:5777459	· ·
2.00	0.16375864	8.5774743	
3.00	0 19089264	8.5770214	
4.00	0.73004984	8,5763873	· · · ·
5.00	0.65635479	8,5755717	
6.VV	0.27990146	0,5/42/43	
7.V0 8.00	0.30134634	Q, 37, 327, 24 	
c 00	0.330/8509	8 5704006	• • • • • • • • • • • • • • • • • • • •
-10.00	0.35670233	8,5687642	
11.00	0.37292104	8.5668546	
12.00	0.38826996	8,5647614	
13.00	0.40285186	8.5624842	···· ·· ··· ··· ··· ··· ··· ··· ··· ··
14.00	0.41675044	8.5600223	
15.00	0.43003497	8.5573752	
16.00	0.44276356	8.5545424	
	0,47307330	8,5449252	
60.00	0.48900074	8,5413499 77777777777777777777777777777777777	
22 00	0.49957046	0,0572074	
23.00	0.51070757	8 5292557	••••
24.00	0.52931312	8.5251118	······
25.00	0.53363661	8,5205756	
20.00	0.57341312	8.5004896	
30.00	0.58154244	8,4949785	
31.00	0.58946797	8,4892699	
32.00	0.50719928	8,4833629	
33.00	0.60474521	8,4772568	
<u>\$4.00</u> 7 = 00	().01211395	8,4709507	
35.00 /r 00	0.01931311	0,4044437	
44 00	0.00333046	0,5802117 8 7704648	
47.00	0.69465031	8 3705132	<b></b>
48.00	0.70015060	8 3613575	
49.00	0.70554876	8.3519982	
50.00	0.71084777	8,3424359	
51.00	0.71605048	8.3326713	
68.00	0.79189601	8.1373801	
60.00	0.79571322	8.1243248	
<u>/0.00</u>	0.79946710	8.1111197	
71.00	0.00315863	8.0977697	
77 00	0.00070076	0.0846800	·
7, 00	0.01053054	8. 6569337	
96.00	0 87737203	7 7354505	
100.00	0,88636707	7.6766013	
104.12	0.89490627	, 7, 6179624	•
103.51	0.90321325	7.5555190	
113.17	0.91123715	7,4925074	<b></b>
118.15	0.91302896	7.4286755	
123.46	0.92624425	7 3647630	

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PARAMETER S	ELUENTRICITY	EIGENFREQUENC
148.72	0.95114030	7.1244507
156.25	0.95621253	7.0720784
104.3/	0.70083468	· · · · · · · · · · · · · · · · · · ·
113.13	0.1000013	0.3010000
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·	PARAMETER	S	ECCENTRICITY	FIGENFREQUEN	с. <u>ү</u>
	0 00		0 00000000	0 4171247	
·····	2 00		0.14580815	9.6474217	
	4.00		0.29511471	9.0464250	
5	6.00		0.24989872	9.6451787	
	8.00		0.28796227	.9.6434329	
•	. 10.00	· - ·	0.31929681	9.6411867	
•	12.00	· · ·	0.37397809	9.6384399 9.6381881	
· · · · · · · · · · · · · · · · · · ·	16.00		0.39780065	9.6314323	
	18.00		0.41984053	9.6271697	
	20.00	····	0.44037699	9.6223976	
	. 22.00		0.45962226	9.6171141	
	24.00	•	0.4774227		
	28.00		0.51111337	0 50X1X10	
······································	30,00		0.52656271	9.5907993	
	32.00	•.	0.54129343	9.5829077	
	34.00		0.55536983	9.5744828	
· · · · · · · · · · · · · · · · · · ·			0.56884720	9,5655201	· · · · · · · · · · · · · · · · · · ·
······			0.20177320	<u> </u>	
· •••••••• •• •• •• •• •• •• •• •• •• ••	42 00	· · • • • • • • • • • • • • • • • • • •	0.60613569	9 5353580	a maga na shiqayya kashina washina shifa markiyani manimu mana aka a kasamin kalima kashina kashina kashina kas
	44.00		0.61764130	9.5241957	
	46.00		0.62873671		
· · <b>· · ·</b> · · · · · ·	54.00		0.66950247	9.4598341	
			0.07889195	9,4452149	
	56,00	•	0.69682667	9.4300016 9.4149037 ·	
	62.00		0.70540002	9.3977766	
	64.00		0.71372752	9.3807571	
	66.00	·	0.72182050	9.3631289	
			0.77922006	9,2001334	
			U.(0))0/18 6 20470/20	9.1770272	
	88.00	*****	0.79784610	9 1291612 ····	
	90.00		0.80374674		
	92.00		0.80950015	9.0790470	
			0.81510990	9.0531950	
	.120.76		0.87762232		
	123,40		0.00275154		
	129.13		0.89281716	8.5420731	
	132.12		0.89777354	8.4970050	
	135.21	······································	0.90265778	ð.4507237	
	141.72		0.91216454		· · · · · · · · · · · · · · · · · · ·
	173 13		0.74170470 0.94515757	2 0584657	
	177 78	•	0.94858349	7 9080349	
	182.67		0.95184111		
	187,65		0.95493041	7.8155427	· · · · · · · · · · · · · · · · · · ·
	192.90		0.95785297		
····* 🐨 - · · - · ·	198.37		0.95061165	7.7291842	
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مريو يوميدون ماميدون يومينيو مريو مريو	، میں اسم عینی سیب ، مارین -	وه ورونه می اوه د م	د این داروی با در ومعدیهای هم اینمه دارم ام مربقه ا	u – ung un u muran angan ni panasana antin nangar 4, manang agam dana si ini ini a	
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TABLE B ORDE	R 9				
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PARAHETER	ECCENTRICITY	EIGENEREQUENCY			
0.00	0.0000000	10.7114340			
5:00	0.13145658	10,7112550			
4.00	0.18510330	10.7107180			
6.00	0.22574309	10.7098230			
8.00	0.27950171	10,7082670			
12 00		10.7009.50			
14.00	0.33908680	10,7026520			
	0.36100805	10.6999590			
18.00	0.38134318	10,6969040			
20.00	0.40034111	10,6934870			
22.00	0.41819077	10.6897050			
24,00	0.43505969	10.6855500			
20.00	0.43100205	10 4741620			
30.00	0 48065806	10 6709100			
32,00	0.49449066	10,6652860			
34.00	0.50774013	10.6592880			
36.00	0.52045536	10.6529140			
38.00	0.53267874	10.6461630			
44.00	0.56674692	10.6236140			
46.00	0.27733206	10.6153220			
48.00 50.00	0,20757407	10.5095680			
52 00	0.60710523	10 5880950			
54.00	0.61643094	10.5782210			
56.00	0.62548472	10.5679420			
70.00	0.68231367	10.4843460			
72.00	0.68962185	10,4706920			
74.00	0.62675338	10,4565990			
	0.79571245	10.4420620			
	0.71715759	10 4446380			
82.00	0 72364990	10 3957440			
102.03	0.78143897	10,2107030			
104.12	0.78681054	10,1886070			
106.28	0.79223200	10.1652740			
108.51	0.79770262	10,1406260			
110.80	0.80322144	10.1145790			
115,17	0.00370723	10.0870420			
15.02	0.81437043	0 1010325			
160,23	0 89549723	9 4302107			
164.37	0.90115751	9.3668839			
168.66	0.90673061	9,3011815			
173.13	0.91219320	9.2332857			
177.78	0.91754128	9.1634380			
187.62	0.92274074	9.0919366			
204.08	<u>0.94174786</u>	8,7971803			
216.26	0.94008212	0,7237749			
222.77	0.95375272	8 5798236			
229.57	0.95728977	8.5105846			
236.69	0.96059533	8.4436475			
244 14	0 96367416	8 7707661			

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TABLE B ORDER	10		
PARAMETERS	ECCENTRICITY	EIGENFREQUENCY	
0.00	0.0000000	11.7708770	
5.00	0.11071369	11.7707440	
4.00	0.16369654	11,7703440	
5.00	0.18827317	11.7700450	
6.00	0.20587741	11.7696790	
8.00	0.23088672	11,768/4/0	
12 00	0,28840482	11,7073499	
	0.31011148	11 76650.20	
15.00	0.32044226	11 7633840	
16.00	0.33038226	11.7623510	
18.00	0.34922452	11.7600830	
20.00	0.36686305	11_7575460	
<b>S</b> S 00	0.38346829	11.7547400	
24.00	0.39917323	11.7516650	
25.00	0.40676215	11.7500200	
20 00	0,41400411	11,7403190	
30.00	0.47320745	11 7647 (760	
35 00	0.47336383	11 7298950	
36,00	0.47929917	11,7275050	· · · · · · · · · · · · · · · · · · ·
38.00	0.49084218	11.7225190	
40.00	0.50197546	11.7172560	
42.00	0.51272823	11.7117140	
44.00	0.52313636	11.7058930	
45.00	0.22819975	11,7028770	
56.00	0.37920097	11,6020140	,
60.00	0.59583303	11 6/00810	
62 00	0 60389811	11 6406730	
64.00	0.61171210	11,6319690	
65.00	0.61554659	11.6275050	
66.00	0.61933420	11.6229670	
85.00	0.68359449	11.5220910	
86.00	0.68662405	11,5159880	
88.00	0.69259127	11.5035370	
96.00	0.09845951	17,4907500	
92.00	0.70070497	11.4770410	
95 00	0.7V977404	11.4641900	
123.46	0.78169975	11 2250870	
126.25	0.73760948	11.1982720	ه ه ه د د دستهدمد ارد مه ممری
120.13	0.79358131	11,1697490	
132.12	0.70061466	11.1393890	
135.21	0.80570869	11.1070510	
138.41	0.81186224	11.0725840	
141.72	0.81807378	11.0358290	
107.62	0.08251861		
107.03	0.88902510	10.4203369	
198 37	<u>0.07540677</u> Δ.00407632	10 26//04/	
204 08	0.90817820	10 1770500	
210.04	0.91436180	10,0856930	
216.26	0.92039765	9,9906754	4
07/ 40	0 0 7 9 7 1 3 7 /	() /004777	

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PARAMETER S	ECCENTRICITY	EIGENFREQUENCY	
244.14	0.94246836	9-5855807	
251.95	0.94733428	9.4819647	
260.15	0.95190012	9.3792327	
208.74	0.72612931	9,2783115	
287.27	0.96373339	9.0852829	· · -
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TABLE B ORDE	R 11		
PARAHETER S	ECCENTRICITY	EIGENFREQUENCY	· · · · · · · · · · · · · · · · · · ·
0.00	0.0000000	12.8264910	
2.00	0.10992353	12.8263900	
4.00	0.15408727	12.8260840	
6.00	. 0,18925124	12.8255760	
8.00	0.62787723	12.8248640	· · · · · · · · · · · · · · ·
12.00	<u> </u>	12 2228280	
14.00		12 8215040	
16.00	0.30451335	12,8199770	
18.90	0.32204705	12.8182440	
20.00	0.33848570	12,8163080	
22.00	0.35308520	12.8141660	
24.00	0.36366672	12.8118190	
26.00	0.38262699	12.8092660	
28,00	0.34594472	12,8062070	
30.00	0.40360201	12 8032420	
34 00	0.43264350	12 7069900	
36.00	0.44394736	12 7934020	
42.00	0.47556435	12.7813860	
44.00	0.48542646	12.7769600	
46.00	0.49498719	12.7723240	
48.00	0.50426523	12,7674760	
56.00	0.51327742	12.7624150	
52.00	0.52205894	12.7571410	
54,00 69,00	0.25050301	12 2021550	
70.00	0.50454620	12 4009170	
72.00	0 59339369	12,6924560	
74.00	0.60510369	12,6847700	
76.00	0.61166704	12,6768580	
78.00	0.61809419	12.6687180	
80.00	0.62439027	12.6603490	
102.03	0.68627887	12.5525650	
194.16	0.07154619	12.5407900	
404 51	0.03037179	12 \$152310	
110.80	0.70773237	12,5013530	
113.17	0.71326595	12,4866710	
115.62	0.71886840	12.4711280	
145.16	0.77885285	12.2510080	
148.72	0.78525815	12.2201950	•••
152.42	0.79173828	12.1872110	بر الاستار الميار
106.25	0.79329295		
100.45	0.00492103	12 0922580	
162 66	0 81839717	12 0205120	
21.6. 26	0.88106907	11 4469510	
222.77	0.88916724	11.3547190	
229.57	0.89633237	11_2558010	
236.69	0.90343621	11,1500630	
244.14	0 91044544	11 0375250	

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• • •	PARAHETER S	ECCENTRICITY	EIGENFREQUENCY	••••••••••••••••••••••••••••••••••••••
•	292.21	0.94543906	10.3201370	•• • • -
	297.27	0.94316915	10.2503790	
•	302.46	0.95080406	10.1806820	
	307.79	0.95334098	10.1112600	
	313.26	0.95577785	10.0423290	
	318.88	0.95311332	9,9740955	<b>.</b> .
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PARAMETER S 0.00 2.00 4.00 6.00 8.00 10.00 12.00 14.00	ECCENTRICITY 0.0000000 0.10163350 0.14336132 0.17513082 0.20170737 0.22494243	EIGENFREQUENCY 13.8788430 13.8787640 13.8785250 13.8781270	· · · · · · · · · · · · · · · · · · ·
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14.00	0.62477644 	13.8768540	
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16 00	0.28238625	13 8737490	
18.00	0.29376737	13,8723950	
20.00	0.31414478	13.8708820	· · <del>· · ·</del> · -
\$2.00	0.32866138	13,8692080	• • • • • • • •
24.00	0.34242852	13.8673740	
28.00	0.36805322	13.8632250	
30.00	0.38004277	13,8609090	
32.00	0.37155377	13.8584350	
34.00	0.40266974	12.8557920	
38.00	0.41330411	13.8500340	
40 00	0 43357820	13 8269110	
50.00	0.47906240	13,8288470	
52.00	0.48741040	13,8247420	
54.00	0.49554145	13,8204720	
56.00	0.50346703	13.8160370	
58,00	0.51119762	13.8114350	
60.00	0.51874284	13.8066680	
62.00	0.52611155	13,8017330	
(8.09	0.57957226	15.7561660	
80.00 Ro 00	0.28565750	15,7497000	
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88 00	0.60887764	13 7220.890	
90.00	0.61442098	13,7147460	- • •
120.76	0.68807332	13.5787970	
123.46	0.69470420	13.5647330	
126.25	0.70051291	13.5498150	
420.13	0.70640044	13,5339780	
132.12	0.71236776	13.5171500	
135.21	0.71841531	13.4992550	
138.41	0.72454551	13,4802060	
108.50	0.77662902	13.2727340	<b></b>
1/5.15	0.78351064	13,75/6/20	
483.62	0.79050307	13 4502210	
487.65	0.77751720	13 1152800	
192.90	0.81108940	13.0677720	
198.37	0.81932339	13 0163350	···
244.14	0.87280407	12,5067550	
251.95	0.88066375	12.4056700	
260.15	0.88853525	12.2955880	
268.74	0.89639225	12,1759310	

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PARAMETER S	ECCENTRICITY	EIGENFREQUENCY	
330.58	0.94077708	11.2529650	
336.67		11.1634350	
342.94	0.94716269	11.0730530	
349.38	0.95018843	10.9821700	
356,00	0.95309490	10,8911520	
302.81	0.7258/724	10.8003730	
309.02	0.43833303	10.7102050	
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TABLE R. OR	DER 13		
PARAHETERS	ECCENTRICITY	EIGENFREQUENCY	· · · · · · · · · · · · · · · · · · ·
0.00	0.00000000	14.9283740	
2.00	0,02452135	14_9283110	
4.00	0,13337550	14,9281210	· ••• • • • • • • • • • • • • • • • • •
6.00	0.16298830	14.9278040	
8_00	0.18778640	14.9273600	
10.00	0.20943893	14.9267890	
	0.22897980	14,9260910	
44.00	0.24070245	14.9252600	
	0,203/47/0	14.9242140	
20.00	0.20304769	14.9236320	
22 00	0 30668845	14 0206050	
24.00	0 31963760	14 9192340	
26.00	0.33197732	14,9176450	
28.00	0.34377446	14.9159280	
34.00	0.37641966	14.9100120	
36.00	0.38651824	14.9077830	
38.00	0.39627772	14,9054260	
40.00	0.40572349	14,9029400	· · · · · · · · · · · · · · · · · · ·
42.00	0.41487786	14.9003260	<u> </u>
44.00	0_42376056	14,8975820	·
46.00	0.43238918		
38.00	0.47960253	14,8747450	
	0.48686929	14.8709500	
64 60	0.49387232	17.8070420	
66 60	0.50751762	16 8588130	
68.00	0.51412425	14 8545000	
70.00	0.52059500	14.8500550	
94.00	0.58935726	14.8786204	***************************************
96.00	0.59446058	14.7799940	
98.00	0.59943153	14.7736450	
106.00	0.60442258	14.7671570	
102.03	0.60935941	14.7604260	
104.12	0.61436692	14.7533360	· · · · · · · · · · · · · · · · · · ·
104.28	0.61944631	14.7458640	
125.27 	0.63041778	14.6293780	
125.41	0.08663074	14.6145710	
147.76 8/6 9/	0.04259201	14.5980120	
462 72	0.09080026	1/ 54/1/50	
152 42	0.71150585	14.5041450	
160 23	0 72458298	14 5028550	
198.37	0.73076964	14,2592220	ويوجد به مع ميد و رو ويدويسو و معصيهم و
204.08	0.78824236	14.2170190	
210.04	0.79581647	14.1712660	anna an
216.26	0.80349192	14.1215780	
222.77	0.81126834	14,0675200	
229.57	0.81914498	14,0086010	
• 236.69	0.82712052	13.9442610	·
297.27	0.88534953	13,2785050	
342.46	0.38961447	15,2114860	
347.14	0.87387767	12,1411640	
215.60 210 RD	0.07014026	12.0074100	אוז אי איידי אוגעי איי בווב איי אוי איי
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PARAMETER S         FCCEUTRICITY         Elgenergenuency           324.65         0.96662697         12.0092250           337.04         0.930766         12.120042           344.47         0.9225943         12.0202600           357.12         0.946727         11.007280           400.00         0.946727         11.007280           400.00         0.946727         11.007280           400.00         0.946727         11.007280           400.00         0.946727         11.5072740           416.49         0.9564332         11.372430           425.12         0.94621719         11.146200					
324.65       0.9666207       12.9092250         357.64       0.7301666       12.1320460         357.04       0.9225055       12.020040         357.04       0.922505       12.020040         357.12       0.902505       12.020040         400.00       0.92250       12.020040         400.00       0.9225055       12.020040         400.00       0.90250       12.020040         400.00       0.90250       11.092820         400.00       0.90250532       11.902820         400.00       0.9564532       11.3734050         416.40       0.95645323       11.3734050         425.12       0.96241719       11.1645200	· · · · · · · · · · ·	PARAMETER S	ECCENTRICITY	EIGENFREQUENCY	
337.0%       0.72301666       12.1320440         332.47       0.7230456       12.020400         377.12       0.72415272       11.6078280         400.00       0.75446431       11.5827440         414.40       0.75446431       11.5827440         425.12       0.764241719       11.1645200	• • •• · · ·	324.65	0.90662697 0.91083945	12.9092250	
	•	337.04 384.47 397.12	0.94857436	12.1320940 12.0209600 11.9078280	······································
		400.00 408.12 416.49	0.94960867 0.95416481 0.95843832	11.7912850 11.5827440. 11.3734050	
		425.12	0.96241719	11.1845200	
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	PARAMETER S	ECCENTRICITY	EIGENFREQUENCY	
	·····			
····	0.00	0.0000000	15_9754390	
	2.00	0.08835126	15.975387()	· · · · · · · · · · · · ·
	4.00	0.12470420	15,9752330	<u></u>
<b>.</b>	6.00		15.9749700	
• • • • • •	8.00 10.00	0.17 367 241	15 07/15/0	
•	12 00	0.21432971	15 0735880	
	14.00	0.23105889	15,9729200	
	16.00	0.24654048	15.9721480	****
	18.00	0,26099772	15.9712740	an anagement and and and an array of the second states a
	20.00	0.27459353	15.9702960	
	22.00	0.28745118	15,9692160	
· · · · · · · · · · · · · · · · · · ·	24.00	0.29966665	15.9680320	
	26.00	0.31131646	15,9667450	
	28.00	0.52246278	15,9655520	
	20,00 70 00	0.33313097	15,9630010	
		0.37210247	15.05/8390	مېرىمى بەر يەر يەر يەر يېرىكى بەر يېرىكى بەر يەر يەر يەر يەر يەر يەر يەر يەر يەر ي
.*	42 00	0 38984458	15 9527230	
	44.00	0.39828890	15.9505030	
•	46.00	0.40649779	15.9481780	
	48.00	0.41448584	15.9457490	
••••••	50.00	0.42226614	15,9432160	
	68.00	0.48458477	15.9156820	na gapter substants to an al consistence and particular states and the substants
	70.00	0.40079423	15,9120940	
•	72.00	0_49688286	15,9083980	
	74.00	0.50285546	15,9045970	موجد موجود که از مربق المربق الم
у 	76.00	0.50871652	15,9006800	······································
	80.00	<u>0,21667966</u>	45 0025780	
	104 12	0.52012050	15 83/2350	
•	106 28	0 58623961	15 8282360	
	108.51	0.59124748	15,8219140	
	410.80	0.59633121	15,8152440	
	113.17	0.60149220	15.8082050	
	115.62	0.60672544	15.8009870	
-	118.15	0.61205170	15.7929140	
	156.25	0.68268252	15.6518350	ـــــــــــــــــــــــــــــــــ
	160,23	0.68918062	15.6345680	
	164.37	0.69577997		
	108.00	0.70248604	15.5965500	a an
	1/3.12	0.7920020	15 653/230	
	- 117.19	0.71020003	15 5224730	
	225 77	0.725/4363	15 2044210	
	220 57	0 78335807	15 2489880	
-	234.69	0.79138792	15,1995070	
	244.14	0.79953339	1.5.1455100	
	251.95	0.80779440	15,0864610	
••••••••••••••••••••••••••••••••••••••	260.15	0.81617051	15.0217440	
	268.74	0.82466030	14:9506510	
	336.67	0.88238582	14,2638600	
	342.94	0.88696664	14,1886700	
•	349.38	0.89155557	14.1092650	
	356.00	0.39614807	14,0254260	

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	- 763 81		13 0369/20	
•	362.01		13.930/469	
	377 04	N 90988728	13 7/52810	· -
+- · ·	425 12	0.93635339	13 0469340	
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•••• • · · ·	443 21	<u> </u>	12 4327250	
••••••	452 69		12 3098290	
···· -	462 48		12 1671500	
	472 59	0.96052574	11 0372640	
	483 03	0 96446315	11 7134180	·· -
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TABLE B ORDE	R 15		
PARAHETER S	ECCENTRICITY	EIGENFREQUENCY	
n. 00	0.0000000	17.0203230	· · · · · · · · · · · · · · · · · · ·
2.00	0.08294662	17.0202810	· · · · · · · · · · · · · · · · · · ·
4.00	0.11710281	17.0201540	
6.00	0.14317550	17.0199430	
8.00	0.16504257	17:0196470	
10.00	0.18420905	17.0192670	
12.00 -	0.20144833	17.0188020	
14.00	0:21722070	17.0182530	
16.00	0.23182008	17.0176190	
18.00	0,24547259 77777777777777777777777777777777777	17,0169000	
20.00	0.62651707 6.2757744	17.0452000	
2/ 00	<u>0.28302937</u>	17 01/2360	
26.00	0.29305677	17 01 31 780	
28 00	0 30361446	17 0120360	
30 00	0 31375048	17 0108090	· · · · · · · · · · · · · · · · · · ·
32 00	0.32350506	17 0094960	
44.00	0.37563579	16,0998360	
46.00	0.38345580	16,9979280	
48.00	0.39107015	16,9959340	
50.00	0.39849104	16.9938540	·
52.00	0.40572952	16,9916890	
54.00	0.41279558	16,9894380	
56.00	0.41969832	16.9871000 -	•
76.00	0.48128173	16.9589800	
. 78.00	0.48681559	16.9556900	
80.00	0.49223313	10,9523120	
	0.4757777 6.50205224	10,9400470	
84 00	0.50202124	16.9492990	
8000	0.20002024 0.51310508	16 0379250	
118 15	0 58119615	16,8709120	
120.76	0.58645214	16.8641410	
123.46	0.59179266	16.8569790	
126.25	0.59721939	16.8493980	· · · · · · · · · · · · · · · · · · ·
120.13	0.60273401	16.8413670	ann an
132.12	0,60833825	16,8328540	
135.21	0.61403385	16.8238230	
173.13	0.67640948	16.6943950	···· · ·
177.78	0.68322918	16.6760989	
182.62	0.69016200	16,6564710	- مسلم مرجد مسلم و مسر و مدر سرو
187.65	0.69720971	16.6353930	
192.90	0.70437407		
178.57	0.71165075	10,5883510	
204.98	0,71902941	10.0620270	
221.93	0.793770/2	16,3034170	
26g 74	0.70131200	16 1000520	
277 78	0.70008436	16 1380380	
287 27	0 80878657	16.0709100	
297 27	0.81771919	15,9968640	
307.79	0.82678066	15.9149590	
377.04	0.87877903	15.2642840	
384.47	0.88365929	15.1819830	ب بيريور يوريور
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	400 00	0 37346455	15 0017010
	408.12	0.89838035	14,9030380
	416.49	0.90329696	14.7982390
	425.12	0.90320674	14,6869830
	472.59	0.93410191	13,9054790
•	483.03	0.93906265	13.6594030
	493.03	0.94551320	13,4106920
	504.75	0.95071098	12,1026340
	520 47	0,72551770 0.95097977	12,41770-20
	540 83	0 96327610	12 4616970
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e u	0.0	0.1	0•2	е•О	0.4	0 • 2	0.6	0.7	8 0	6.0	0.95
त्त्न	1.84118	1.83697	1.82399	1.80163	1.76857	1.72255	1.65971	1.57293	1.44713	1.23890	1.05117
2	3.05424	3.05416	3.05303	3.04785	3.03291	2.99902	2.93325	2.81784	2.62290	2.26842	. 1.93390
т	4.20119	4.20116	4.20065	4.19816	4.19047	4.16834	4.11558	3.99860	3.76069	3.27818	2.80370
4	5.31755	5.31751	5.31697	5.31444	5.30677	5.28735	5.24099	5.13046	4.87102	4.27764	3.66806
ы	6.41562	6.41558	6.41496	6.41211	6.40364	6.38287	6.33561	6.22642	5.95653	5.26935	4.52909
9	7.50127	7.50122	7.50053	7.49734	7.48786	7.46480	7.41345	7.29919	7.01989	6.25412	5.38760
۲ ۲	8.57784	8.57779	8.57702	8.57348	8.56295	8.53740	8.48086	8.35762	8.06497	7.23217	6.24420
ω	9.64742	9.64737	9.64652	9.64262	9.63104	9.60293	9.54085	9.40676	9.0960.9	8.20352	7.07837
<u>م</u>	10.7114	10.7114	10.7105	10.7062	10.6936	10.6629	10.5951	10.4494	10.1170	9.16815	7.86750
10	11.7709	11.7708	11.7698	11.7652	11.7515	11.7182	11.6448	11.4871	11.1306	10.0932	8.68659
	12.8265	12.8264	12.8253	12.8204	12.8056	12.7697	12.6907	12.5208	12.1388	10.9734	9.56250
12	13.8788	13.8788	13.8776	13.8723	13.8564	13.8180	13.7332	13.5511	13.1429	10.9735	10.5182
13	14.9284	14.9283	14.9271	14.9214	14.9045	14.8635	14.7730	14.5787	14.1437	12.8320	11.4845
74	15.9754	15.9754	15.9740	15.9680	15.9500	15.9064	15.8103	15.6038	15.1418	13.9325	.12.3478
15	17.0203	17.0202	17.0188	17.0124	16.9934	16.9472	16.8454	16.6267	16.1377	15.1242	13.1859

TABLES C - EIGEN FREQUENCIES FOR EVEN FUNCTIONS.

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TABLES D - EIGEN FREQUENCIES FOR ODD FUNCTIONS.

0.95	3.05788	3.66087	4.34136	4.97720	5.67726	6.39822	7.13612	7.88778	8.65064	9.42266	10.2022	10.9879	11.7759	12.4731	13.1971
6.0	2.65073	3.37472	4.15408	4.97410	5.82354	6.69411	7.57976	8.47614	9.38011	10.2894	11.2022	12.1174	13.0341	13.9515	14.8692
0.8	2.31144	3.18097	4.11874	5.09509	6.09191	7.09864	8.10922	9.12025	10.1299	11.1374	12.1423	13.1447	14.1446	15.1423	16.1379
0.7	2.14225	3.11039	4.14055	5.19402	6.25292	7.30968	8.36161	9.40881	10.4499	11.4872	12.5208	13.5511	14.5787	15.6038	16.6267
0.6	2.03702	3.07914	4.16500	5.25585	6.33975	7.41455	8.48114	9.54093	10.5952	11.6448	12.6907	13.7332	14.7732	15.8103	16.8454
0.5	1.96578	3.06463	4.18280	5.29016	<del>6</del> .38337	7.46489	8.53741	9.60293	10.6629	11.7182	12.7697	13.8180	14.8635	15.9064	16.9472
0.4	1.91598	3.05806	4.19344	5.30717	6.40368	7.48786	8.56295,	9.63104	10.6936	11.7515	12.8056	13.8564	14.9045	15.9500	16.9934
0.3	1.88137	3.05536	4.19870	5.31447	6.41212	7.49734	8.57348	9.64262	10.7062	11.7652	12.8204	13.8723	14.9214	15.9680	17.0124
0.2	1.85850	3.05445	4.20069	5.31697	6.41496	7.50053	8.57702	9.64652	10. 7105	11.7698	12.8253	13.8776	14.9271	15.9740	17.0188
0.1	1.84543	3.05425	4.20116	5.31752	6.41558	7.50122	8.57779	9.64737	10.7114	11.7708	12.8264	13.8788	14.9283	15.9754	17.0202
0.0	1.84118	3.05424	4.20119	5.31755	6.41562	7.50127	8.57784	9.64742	10.7114	11.7709	12.8265	13.8788	14.9284	15.9754	17.0203
U E	4	N	m	4	۰. در	9	7	ω.	6	10	н Н	12	13	4 7 7	15

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My thanks are due to Miss. Vivia Johnson who typed this work and also to Mrs. Brenda Moore who helped with the Figures.

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## APPENDIX I.

SOME PROPERTIES OF BESSEL FUNCTIONS.

Bessel functions  $J_n(x)$  of the first kind are solu-

$$\frac{d^2y}{dx^2} + \frac{1}{x}\frac{dy}{dx} + \left(1 - \frac{n^2}{x^2}\right)y = 0$$

where n is a positive integer.

A few of the important properties of these functions are listed below. These properties have been used frequently in the text.

(1) 
$$J_{-n}^{(x)} = (-1)^{n} J_{n}^{(x)}$$
  
(2)  $J_{n}^{(x)} = (-1)^{n} J_{n}^{(x)}$   
(3)  $J_{n}^{\prime}(x) = n J_{n}^{(x)} | x - J_{n+1}^{(x)}$   
(4)  $J_{n}^{\prime}(x) = -n J_{n}^{(x)} | x - J_{n-1}^{(x)}$   
(5)  $2 J_{n}^{\prime}(x) = J_{n-1}^{(x)} - J_{n+1}^{(x)}$   
(6)  $2n J_{n}^{(x)} | x = J_{n+1}^{(x)} + J_{n-1}^{(x)}$ 

The formulae (3) - (6) are recurrence relationships.

(7) Addition formulae:  
If 
$$R = (x^2 + y^2 - 2xy \cos a)^{\frac{1}{2}}$$
 then  
(i)  $\mathcal{J}_0(R) = \mathcal{J}_0(x) \mathcal{J}_0(y) + 2 \stackrel{\mathcal{S}}{\underset{h=1}{\leq}} \mathcal{J}_{\Lambda}(x) \mathcal{J}_{\Lambda}(y) \cos \pi a$   
(ii)  $\mathcal{R}^{-n} \mathcal{J}_n(R) = (xy/2)^{-n} [(n) \stackrel{\mathcal{S}}{\underset{h=0}{\leq}} (h+n) \mathcal{J}(x) \mathcal{J}(y) {n \choose \mu} (\cos a),$   
and (ii)  $\mathcal{R}^{-n} \mathcal{J}_n(R) = (xy/2)^{-n} [(n) \stackrel{\mathcal{S}}{\underset{h=0}{\leq}} (h+n) \mathcal{J}_{\lambda+n} (x) \mathcal{J}(y) {n \choose \mu} (\cos a),$ 

where  $\binom{n}{\lambda}$  represents Gegenbauer polynomial and  $|x| < |y|^{2}$ 



APPENDIX III. About the Computer Programs. In programs EJ and OJ, the eccentricities of the А ellipses and the corresponding eigen values for given values of the parameter s were obtained. Programs EJ were for even radial Mathieu functions and Programs OJ were for odd radial Mathieu functions. The input variables were (i) S = parameter s (ii) BE = the characteristic number 'be' or 'bo' according as the function is even or odd The variables used in the programs were (i) DE = the coefficients De or Do of expansions, which are computed in the program for each particular s and the corresponding characteristic number.  $X = w = \sqrt{\Lambda} \cosh \xi$ (ii) (iiii)  $ZI = \tilde{z}$ CEDASH or SEDASH = the value of Je' or Jo' for the (iv) х. The values obtained were  $W = W_0 = \text{the value } \sqrt{2} \cosh \frac{3}{2}$  of w which makes (i) the function zero. (ii) E = the eccentricity of the ellipse EIGEN VALUE = the cut-off frequency corresponding (iii) to the eccentricity. In program LCM, the cut-off frequencies in elliptic В

ducts of eccentricities e = .1 (.1) .9 and e = .95 were obtained.

The input variables were

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(i) X = the eccentricities obtained from Program EJ or OJ

(ii) Y = the eigen values corresponding to the above eccentricities, also obtained from the Program

EJ or OJ

The variables used in the program were

(i) XL = seven values of X, nearest to the eccentricityfor which the eigen value is to be evaluated.

(ii) YL = seven values of Y, corresponding to the seven values of X above.

Subroutine INTER evaluates the successive convergents for linear iterated interpolation.

The values obtained were

FUN = the successive convergents and hence also the final convergent for this interpolation.

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	APPENDIX TV COMPLITED DEOCEAM LISTING
	CONCOLL FROGRAM BISTING.
	MASTER FJ10
	DOUBLE PRECISION BEALPHARY.GTHTEREMASREMANTAHZ.ERROR.A.B
	$\frac{1}{1} = \frac{1}{1} = \frac{1}$
	1CEDASECTOU) .B(60) .FREM(50) .SREM(50) .U(60) .E(60) .EIGENVALUE(60) .
	2CED(20),Y(20),T(60),BET(60)
	$p_{1=3,1415926536}$
	101 FORMAT(F5.2+F12.5)
	READ(1,102)((T(1),2ET(1)),1=38,58)
	-102 FOPMAT(F6.5,F12.8)
	00-30 [=1,58
	$\frac{11(1.11.52)(0.10.47)}{(1.11.52)(1.11.52)}$
[ ·	$\frac{BE(1) = BET(1) + 21 + SGRT(S(1))}{BE(1) = BET(1) + 21 + SGRT(S(1))}$
	47 ALPHA(1)=RF(1)-S(1)/2
	00 8 F=2,45,2
	$\frac{8}{100} \sqrt{(5)} = 4 \times (A[PPA(1) - (1 - 2) \times (1 - 2)]/S(1)}$
	((4) = V(2)
	G(6) = V(4) - 2 * H(4)
	$\frac{1}{10000000000000000000000000000000000$
	H1=H(4)
	$h(X \neq t)$
	IF(A8S(G(A)),LT.1)CO TO 5
	$\frac{p_0}{c_1} = \frac{p_0}{c_1} + \frac{p_0}{c_2} + $
	$\frac{1}{1} + \frac{1}{1} + \frac{1}$
	Z-M=X≪
•	H1=R(F-2)
<u>م</u>	IF(ABS(G(M)).LT.1)GO TO 9
g	$\frac{9}{10}(40) - 17 \sqrt{40}$
	DO 10 M=2,45-MX-2,2
	H(46-13) = V(46-11) - G(48-13)
	10 - 6(46 - N) = 1/H(46 - M)
1	H(MK) = V(FK) - G(MK+2)
	$\frac{1}{1} = \frac{1}{1} = \frac{1}$
	$\frac{10116(2,205)(0(2),0-6,00,2)}{10116(2,205)(0(2),0-6,06,2)}$
	203 = F(RMAT(74D3U, 2D))
	IF(ARS(H1-H(NK))1E-10)80,80,81
	81 WRITE(2,203) H1, H(MK)
	H2=H(NK)
	FREM(4)#H(4)#H(4) FREM(4)#H(4)
1	$1 + (m \cdot r \cdot r \cdot $
	DO 221 M=8, MK, 2
	221 FREN(M)=H(H)*H(P)*(1+FREM(M-2))
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	21 SRFR(24)=1+6(26)*6(26)
	DO 22 M=4,25-MK,2
	22 SREM(20-M)=1+G(20-M+2)*G(20-M+2)*SREM(20-M+2)
	H(MK)=(FREE(MK)*H2*SRED(NK)*H1)/(FRED(MK)+SREM(NK))
	ERROR = (H1-H2)7 (FREP(NK)+SREN(HK))
]	00 23 N = InK+2, IK+8,2
	23 G(M) = G(M) - ERROR * (SREM(M-2)-1)
	IF(MK.E0.4)60 TO 28
- 1	DO 13 N=4,114-2,2
1 -	13 H(N) = H(N) - EPROR + FREM(N)
	28  H(MK) = H1 - FRPOR + FRP(MK)
•	VR11F(7,705)(6(P);PHK+7;05+8;7)
÷,	WEJTE(2,203)(H(M),M=4,MK,2)
4	$\frac{1}{12} = \frac{1}{12} $
;	
į	$\frac{1}{1}$
į	$\Lambda = E(Z)$
	bi 11 P=4.46.2
• ,	11 4 = A + B(N)
	00 16 M=2.46.2
	16 DE(1,M) = B(N)/A
	URITE(2,201)(DE(1,M), P=2,40,2)
!	201 FOENAT(1X,6E20.10)
	WRITE(2,901)
	901 FORMAT(1X, X, 20X, 21, 20X, CEDASE)
	X(1) = SOFT(S(1))
• •	21(1) = FZI(X(1))
	(EDASH(T)=0.0)
	VRTTE(2, 000) X(1), ZT(1), CEDASH(1)
.	00 20 J=1,49
	X(J+1) = X(J) + 0.5
	JF(F, 0F, 45)X(J+1)=X(J)+0.1
	71/111/~P71/V/111/V
	$\sum \left[ \sum \left[$
	$\frac{1}{10000000000000000000000000000000000$
	900  FORMAT (SE20, S)
	1F(CFDASH(J+1))370,371,20
	370 1F((J+1), EQ. 2)60 TO 281
	43 CED(1)=CFEAST(HAX-1)
i.	CED(2)=CEDASH(MAX)
17	Y(1) = X(MAX-1)
	Y(2) = X(MAX)
1	45 DO 5 K=1,18
-	Y(K+2) = (Y(K+1) * CED(1) - Y(1) * CED(K+1)) / (CED(1) - CED(K+1))
	$\psi(1) = Y(X+2)$
1	CED(K+2) = ECEDASH(Y(K+2))
	1F(ABS(CED(Y+2))1F - 03) - 42,42,6
1	
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	$\frac{1}{1} = \frac{1}{1} = \frac{1}$
1	-904 FORMATCIX, VALUE OF CEDASH NOT ACCURATE 72820.8)
	5 CONTINUE
-	-321 $(1) = 2(342)$
- I	$= \frac{42}{E(1)} = SQRT(S(1))/E(1)$
]	EIGENVALUE(T) = W(T) * SORT(SORT(1E(T)))
	WRITE(27902)
	= 902  FORMAT(3X,1HS,12X,1HW,18X,1HE,14X,10HF1GEAVALUE)
]-	903 FORPAT(1X,F5.2,3E20.8)
<u></u>	<u>60 TO 30</u>
	281 X (1) = X (J)
	00500  J1=1.9
	x(J1+1) = x(J1) + 0.01
·	CEUASH(J1+1) = FCEDASH(X(J1+1))
	URTIF(2,50G)X(FAX).21(FAX),CEDASE(FAX)
1	$\frac{1 + (C + D + S + (J + 1) + S + S + (J + 2)}{S + S + S + S + (J + 1) + S + S + (J + 2)}$
- 1:-	$\frac{1}{1} \frac{1}{1} \frac{1}$
	CEDT2D=CLDASH(J+1)
	Y(1) = X(MAX)
	Y(2)=CEDASH(J+1)
	500 CONTINUE
	20 CONTINUE
	30 CONTINUE
	STOP
	FUNCTION FZI(X)
	COMPON S(70), DE(70,60), I, PI
	FZI=ACOSH(X/SORT(S(1)))
	FND
	FUNCTION FREDASH(X)
	COMMON S(70), DE(70,60),1,P1
.	DIMENSION SOL(46), EJ(200)
- 1	(A11 - BG701(X, 56, B1, 1E-09, IER))
	SOL(2)=-2*DE(1,2)*BJ(2)
	SOL(4) = SOL(2) - DE(1, 4) * (DJ(2) - BJ(4))
	$\frac{561(6) + 561(4) + 96(1,6) + (63(4) + 63(6))}{561(8) + 501(6) + 66(1,8) + (61(6) + 81(8))}$
	$= \frac{1}{10} \frac{1}{10}$
	00 8 K=12,46,2
1-	$= \frac{8}{801} \left( \frac{1}{8} \right) = \frac{8}{201} \left( \frac{1}{8} - 2 \right) - \frac{8}{801} \left( \frac{1}{8} - 2 \right) + \frac{8}{801} \left( \frac{1}{8} - 2 \right) - \frac{8}{800} \left( \frac{1}{8} - 2 \right) - \frac{8}{80} \left( \frac{1}{$
	PETIRK
.	END
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				·····
		SUBROUTINE DO701(X,N,BJ,A,1ER)		
	a - a ananati'an tani ma' itali	DIMENSION , BJ(200)		
1		00 - 4 = 1,200		
	4	BJ(K) = 0.0		
		Y = X	······	
	· · · · · · · · · · · · · · · · · · ·	TF(X)1,2,40	3	
	۷			
	1		· · ·	
		$T \in R = 0$		
	· ·	k1=N+1		
		BPREV=.0		••••••••••••••••••••••••••••••••••••••
	C	COMPUTE STARTING VALUE OF 4		
		$\int N = M$		
		$\frac{1}{87} \frac{1}{100} \frac{1}{$		
	<u> </u>	$60 \times 10 \times 10^{-10}$		
1	21	mZER0=X+20		<b></b>
	74	MWAX=190	aa agaalaa dhiir waxaadaa yaaankiin a waxaanya ahiiniin waxaan a ah ya huwaalko ahaa a	
	100	00 190 M=MZERO, NVAX, 3		
1	C	OVERFLOW TRAP BASED ON 1.670	· · · · · · · · · · · · · · · · · · ·	
:]	2.5	X0MIN=EXP(AL06(1.E-/0)/11)	·	
i		$\frac{1}{1} \frac{1}{2} \frac{1}$		
		M=M-3		مسجد مندر مشغث
	1	D=10	ar gegan gade signer vegengangan gebildelen blein, in ofste vedere verseningan bi devengen ger	•••••••••••
	*****	LER=M	n an	
1		GO TO 23		
	( · · ·	SET F(M), F(M-1)	والمراسبين والمراجب والمراجب والمحافظ والمحافظ والمحافظ والمحافظ والمحافظ والمحافظ والمحافظ والمحافظ	
	130	BJ((4+1)=0.	ه سنتجار من والدكامة وعاليت الماري به الكليدية والمستجمع بالمراجع بالمراجع المراجع المراجع المراجع ال	
		NJ (#7-7.00770 - N2 No1	مېرىغان سو كەسەرىيە مەربەر بەرى بەر يەرى بەر يەر يەرى بەر يەرى بەر يەر	· ••• ••• • • • • • • • • • • • • • • •
	1 8 mart	$160 \ k=1.82$		
		M X = N - X		
	160	BJ(MK)=2.* KK *BJ(1.4+1)/X-BJ(MK+2)		
		SUM = -[J(1)]		
. 1		00 161 K=1,N,2		
- i	161	SUM=2, (*8,17K)+SUK		
	162	$\frac{1}{2} \frac{1}{2} \frac{1}$		·
		IF(ABS(BI(N1) - BPREV) - ABS(D + BJ(N1))) 10,10,190	**************************************	
	190	BPREV=BJ(^1)	1999, and a sub-1999 the sub-data suggest of the Advances was added to be the sub-sub-sub-sub-sub-sub-sub-sub-	
		1ER=199		
1	10	lf(Y-X) 201,200,201		
	201	DO 202 k = 2.10.2		
	- 202	BJ(%)=-BJ(K) DFTCDF		
	200	FEIVKA FRI		
		FINISH		
			) yang per aga kalambingan ang gin dia manang per sa dia ang per sa di kang per sa s	· · · · · · · · · · · · · · · · · · ·
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			الم معالم الي مارين مارين المراجع المراجع و المراجع المراجع المراجع المراجع المراجع المراجع المراجع المراجع الم المراجع المراجع	
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				National Inc.

FASTORE 0.01         DOUBLE PERCENTION NETACHARY, A.M., FRENSSERET, NETACE         CONNECT SCOTT, BESTACHARY, Y.A.M., FRENSSERET, NETACE TATE         CONNECT SCOTT, BESTACHARY, Y.A.M., FRENSSERET, NETACE         TEREASTANE AFTERS (A LEPKA (SD), VEST), TEST, SD), TEST, SD), TEST, SD), STET, CONT, SECTOR, TEST, SD), SD), TEST, SD), TEST, SD), TEST, SD), TEST, SD), TEST, SD), SD), TEST, SD), SD), SD), SD), SD), SD), SD), SD)	STER 0J1 JBLE PRECISION BE, ALPHA, V, 6, H, FREM, SREN, H1, H2, A, B MON S(50), DE(50, 56), J, PI AENSION BE(50), ALPHA(50), V(56), G(50), H(50), X(100), ZI(100), ASH(190), V(50), E(50), EIGENVALUE(50), CED(20), Y(20), B(50), ASH(190), SPEH(40), SE(196), GE(50), FELTA(50) S, T415926536 FAD(1, 100)(S(T), I=1, 48) DRFAT(16F5, 2) FAD(1, 101)(RE(T), I=1, 31, 5) FAD(1, 101)(RE(T), I=1, 31, 5)
FASTER 031 <ul> <li>DREH L* PROTISING TRETAINANY, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4,</li></ul>	STER 0J1 JBLE PRECISION BE, ALPHA, V, G, H, FREM, SREH, H1, H2, A, B MON S(50), DE(50, 50), I, PI MENSION RE(50), ALPHA(50), V(50), G(50), H(50), X(100), ZI(100), ASH(190), V(50), E(50), EISENVALUE(50), CED(20), Y(20), B(50), ASH(190), SPEN(40), SE(190), GE(50), FELTA(50) S. 1415926536 FAD(1, 100)(S(T), I=1, 48) JRPAT(16F5, 2) FAD(1, 101)(RE(T), I=1, 31, 5) FAD(1, 101)(RE(T), I=1, 31, 5)
PASTER 01       DOMENT STUDY NETATION V. (1) (1) FEED (SEED (STUDY ETATION V. (1) (1) FEED (SEED (STUDY ETATION V. (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	STER 0J1         JBLE PRECISION BE, ALPHA, V, G, H, FREM, SREN, H1, H2, A, B         MON S(50), DE(50, 50), 1, PI         MENSION BE(50), ALPHA(50), V(56), G(50), H(50), X(100), ZI(100),         ASH(190), SF(50), E(50), E(50), V(56), G(50), H(50), X(100), ZI(100),         ASH(190), SF(50), E(50), FE(50), CED(20), Y(20), B(50),         ASH(190), SF(50), E(50), FE(50), CED(20), Y(20), B(50),         ASH(190), SF(40), SE(196), GE(50), FE(17(50))         STA15926536         FAD(1, 100)(S(1), I=1, 31, 5))         FAD(1, 101)(RE(1), I=1, 31, 5))
D018.1.F * PF*CTS108* 38.57.17*08.74.63*0.74.63*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.65*0.74.75*0.74.65*0.74.75*0.74.65*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.74.75*0.75*0.75*0.75*0.75*0.75*0.75*0.75*0	UBLE PRECISION BE.ALPHA.V.G.H.FREM.SREM.H1.H2.A.B MON \$(50), DE(50,50), 1, PI MENSION BE(50), ALPHA(50), V(56), G(50), H(50), X(100), ZI(100), ASH(190), V(50), E(50), EISENVALUE(50), CED(20), Y(20), B(50), 4(30), SPEN(40), SE(196), GE(50), FELTA(50) 3.1415926536 FAD(1,100)(S(T), I=1,48) DRMAT(16F5.2) FAD(1,101)(RE(T), I=1,31,5) FAD(1,101)(RE(T), I=1,31,5)
C0-8108 \$(50), B(23, 80, (1, 1)) T) EFAS(AF, B(75)); A(50); A(50); A(50); A(50); Y(100); Z1(100); YERAS(AF, B(75)); A(50); F(150); F(11, 1(50); Y(10); Y(100); Y(100); YERAS(AF, B(75); Y(10); Y(17); Y(17	MON \$(50), DE(50, 56), 1, PI MENSION BF(50), ALPHA(50), V(56), G(50), H(50), X(100), ZI(100), ASH(190), V(50), E(50), EISENVALUE(50), CED(20), Y(20), B(50), A(30), SPEN(40), SE(196), GE(50), FELTA(50) 3.1415926536 EAD(1,100)(S(1), I=1,48) DRPAT(16F5.2) EAD(1,101)(RE(1), I=1,31,5) EAD(1,101)(RE(1), I=1,31,5)
b = D S(t) (100 / t = C = D (100 / t = D (100 / t = C = D (100 / t = D (100 / t = C = D (100 / t = D (100 / t = C = D (100 / t	ASH(190); S(50); E(50); EIGENVALUE(50); C(50); A(50); A(100); Z1(100); A(30); SPEH(40); SE(190); GE(50); FELTA(50) 3.1415926536 FAD(1,100)(S(T); I=1,48) JRMAT(16F5.2) FAD(1,101)(RE(T); I=1,31; S) FAD(1,101)(RE(T); I=1,31; S)
2F # 6ft 30 J, SPE1 (40) 7 SE (3 F6) 7 GE (3 T6) 7 GE (3 T6 5)         P1 = 3 T (3 3 2 2 8 5 36         P1 = 3 T (3 3 2 8 8 5 6 (1 7 F 1 7 4 5 )         P1 = 3 T (3 3 2 8 8 5 6 (1 7 F 1 7 4 5 )         P1 = 3 T (3 3 2 8 8 5 6 (1 7 F 1 7 4 5 )         P1 = 4 (1 7 F 6 7 4 5 (1 7 F 1 7 4 5 )         P1 = 6 (1 7 F 6 7 4 5 (1 7 F 1 7 4 5 )         P1 = 6 (1 7 F 6 7 4 5 (1 7 F 1 7 4 5 )         P1 = 6 (1 7 F 6 7 4 5 (1 7 F 1 7 4 5 )         P1 = 6 (1 7 F 6 7 4 5 (1 7 F 1 7 4 5 )         P1 = 7 (1 7 F 7 7 5 6 0 F (1 7 1 7 4 7 5 )         P1 = 7 (1 7 7 7 5 6 0 F (1 7 4 7 5 )         P1 = 7 (1 7 7 7 7 6 ) 6 F (1 7 7 7 5 6 F 1 0 5 2         P1 = 7 (1 7 7 7 7 1 7 6 6 F 1 0 7 4 7 7 1 5 6 F 1 0 5 2         P1 = 7 (1 7 7 7 1 7 6 6 F 1 0 7 4 7 7 1 5 6 F 1 0 5 2         P1 = 7 (1 7 7 7 1 7 6 6 F 1 0 7 4 7 7 1 5 6 F 1 0 5 2         P1 = 7 (1 7 7 7 1 7 6 6 F 1 0 7 4 7 7 1 5 7 5 5 7 1 6 F 1 0 5 2         P1 = 7 (1 7 7 7 1 7 6 6 F 1 0 7 4 7 7 1 7 1 7 1 7 6 7 1 5 5 7 1 6 F 1 0 5 5 7 1 6 F 1 0 5 5 7 1 6 F 1 0 5 8         P1 = 7 (1 7 6 7 5 1 7 6 7 1 7 7 7 7 7 1 6 7 1 0 5 7 7 1 7 5 6 7 1 7 5 6 7 1 7 5 7 1 7 6 7 1 7 5 7 1 7 6 7 1 7 7 1 7 7 1 7 7 1 7 7 1 7 7 1 7 7 7 1 7 7 1 7 7 1 7 7 1 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	(30), SPEN(40), SE(100), GE(50), FELTA(50) 3.1415926536 EAD(1,100)(S(T),I=1,48) ORMAT(16F5.2) EAD(1,101)(RE(T),I=1,31,5) EAD(1,101)(RE(T),I=1,31,5)
$ \begin{array}{c} & \mbox{PII = 5, 1743 59, 26536} \\ & \mbox{PI = 5, 1743 59, 226336} \\ & \mbox{PI = 6, 1743 100 (16 (17), 1 = 1, 237, 5)} \\ & \mbox{PI = 6, 1743 100 (16 (17), 1 = 1, 237, 5)} \\ & \mbox{PI = 6, 1743 142 7, 100 (16 (17), 1 = 1, 237, 5)} \\ & \mbox{PI = 6, 1743 142 7, 100 (177, 121, 121, 121, 121, 123, 125)} \\ & \mbox{PI = 6, 1743 142 7, 100 (177, 121, 121, 121, 121, 123, 125)} \\ & PI = 6, 1743 142 7, 100 (177, 121, 121, 121, 121, 121, 121, 121, $	3.1415926536 EAD(1,100)(S(T),I=1,48) DRMAT(16F5.2) EAD(1,101)(RE(T),I=1,31,5) EAD(1,101)(RE(T),I=1,31,5)
$ \begin{array}{c} \begin{tabular}{lllllllllllllllllllllllllllllllllll$	EAD(1,100)(S(T),1=1,48) DRFAT(16F5.2) EAD(1,101)(RE(T),1=1,31,5) EAD(1,101)(RE(T),1=1,31,5)
100       FOR P (177 3 2)         • E E AD (1, 101 2) (BF (1), 1 = 3, 2, 50)         101       FORMAT (6 12, 30)         • READ (1, 101 2) (BF (1), 1 = 3, 2, 50)         • READ (1, 101 2) (BF (1), 1 = 3, 2, 50)         • POT SO (1 = 2, 50)         • POT SO (1 = 2, 50)         • POT SO (1 = 2, 50)         • F (1, (1, 1, 1, 3, 50, 10, 47)         • F (1, (1, 1, 1, 3, 50, 10, 47)         • F (1, (1, 1, 1, 3, 50, 10, 47)         • F (1, (1, 1, 1, 3, 50, 10, 47)         • F (1, (1, 1, 3, 3, (1, 1, 1, 1, 1, 1)))))         • F (1, (1, 1, 3, 3, (1, 1, 1, 1, 1)))))         • F (1, (1, 1, 3, 3, (1, 1, 1, 1, 1))))))         • F (1, (1, 2, 1, 4, 3, 40), 11, (1, 2, 0))))))         • F (1, (1, 2, 1, 4, 3, 40), 11, (1, 2, 0))))))))))))))))))))))))))))))))))	$\frac{1}{2} = \frac{1}{2} = \frac{1}$
READ (1, 101) (REC17, 1 = 32, 751)         101*PARMAT(6F17, 8)         READ (1, 12) (REC17, 1 = 32, 751)         102*FORMAT(6F17, 8)         103*FORMAT(6F17, 8)         104*FORMAT(6F17, 8)         105*FORMAT(6F17, 8)         105*FORMAT, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,	$\sum_{i=1}^{n} \sum_{j=1}^{n} \sum_{i=1}^{n} \sum_{i$
$ \begin{array}{c} 101 = 2 0 \text{ (A} + 17 $	これ以入すプリリナズ(のに入すナナチャウにナウビナー・ニュート・ニュート)
$ \begin{array}{c} REA(1, 162) (DEUTA(1), 1241, 547, 5) \\ 102 \\ TOREAT(617, 550) \\ 0 \\ 0 \\ 1 \\ (1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1$	NAT (6F12.8)
102 FURKAT(0,F17,K) = 0 0.30 T(2.2,5) = 1 F(1, F(7), K) = 0 T(7, K) = 0 T(7	EAD(1,102)(DELTA(1),1=1,31,5)
F = (1, 1, 1, 3) (1, 2) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1, 3) (1,	(MA1(5)12.8) 0 30 (=2.50
$ \begin{array}{c} \left[ f \in (1 + \xi_{1}^{-}, \chi_{1}, \chi_{2}^{-}, \chi_{1}^{-}, \xi_{1}^{-}, \chi_{2}^{-}, \chi_{1}^{-}, \chi_{2}^{-}, \chi_{1}^{-}, \chi_{2}^{-}, \chi_{1}^{-}, \chi_{2}^{-}, \chi_{1}^{-}, \chi_{2}^{-}, \chi_{2}^{-}, \chi_{1}^{-}, \chi_{2}^{-}, \chi_{2}^$	F(1, 17, 5) (0 T(1.5)
	F(1.£0.6)60 TO 47
$ \begin{array}{c} 1 \ {\rm F} \left( 1, {\rm E} \left( 1, {\rm E} \left( 1, {\rm E} \right), {\rm E} \left($	-(1.LT.11.AND.1.GT.6) GC TU 52
$ \begin{array}{c} (1, (1, (1, (1, (1, (1, (1, (1, (1, (1,$	F(I.E0.11)60 TO 47
IF(1, Gr. 16, ARD, I, U, T, 21)50 TO 55         IF(1, Gr. 21, ARD, I, U, T, 26)50 TO 55         IF(1, Gr. 25)50 TO 37 47         IF(1, Gr. 25, ARD, I, U, T, 26)50 TO 55         IF(1, Gr. 31, 50) TO 37         IF(1, Gr. 31, 50) TO 37         S1         B26         G0 TO 58         S2         M=11         G0 TO 58         S2         S4         S2         G0 TO 58         S4         S4         S4         S4         S4         S4         S6         S6         S6         S6         S6         S6         S6         S6         S7         S8         S6         S6         S7         S6         S7         S8         S9         S9 <td>F(1 FD 16)50 TU 62</td>	F(1 FD 16)50 TU 62
$ \begin{array}{c} 1 F(1, E_{0}, 21) f(0, 11) = 47 \\ 1 F(1, E_{0}, 26) f(0, 10, 10, 10, 55) \\ 1 F(1, E_{0}, 26) f(0, 10, 47) \\ 1 F(1, E_{0}, 26) f(1, 10, 10, 10, 10, 10, 10, 10, 10, 10, 1$	F(1.67.16.AND.1.LT.21)60 TO 54
$ \begin{array}{c} 1 + F(1, 0, 1, 2^{2}, 2^{2}, 0) + (0, 2^{2}, 5) + (0, 2^{2}, 5) + (0, 2^{2}, 5) + (0, 2^{2}, 5) + (0, 2^{2}, 3) + (0, 2^{2}, 5) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, 2^{2}, 3) + (0, $	F(1.E0.21)60 10 47
$\frac{1}{15} (1, 60, 60, 60, 10, 47)$ $\frac{1}{15} (1, 65, 267, 60, 10, 47)$ $\frac{1}{5} (1, 65, 281) 60, 10, 47$ $\frac{1}{5} (1, 65, 31) 60, 10, 58$ $\frac{1}{5} (1, 58, 64, 53) 70, 58$ $\frac{1}{5} (1, 58, 64, 58, 64, 58) 70, 58$ $\frac{1}{5} (1, 58, 64, 58, 64, 58) 70, 58$ $\frac{1}{5} ($	- (1.6T.21.AND.1.LT.20)00 TO 55
$ \begin{array}{c} 1F(1, GF, S1)GO(10, A7) \\ 51 & 11=6 \\ 60 & 10^{1} S8 \\ 52 & 14=14 \\ 60 & 10^{1} S8 \\ 53 & 14=16 \\ 60 & 10^{1} S8 \\ 54 & 15=24 \\ 60 & 10^{1} S8 \\ 55 & -15=26 \\ 60 & 10^{1} S8 \\ 55 & -15=26 \\ 60 & 10^{1} S8 \\ 58 & -15=26 \\ 61 & 10^{1} S8 \\ 58 & -15=26 \\ 61 & 10^{1} S8 \\ 58 & -15=26 \\ 61 & 10^{1} S8 \\ 58 & -15=26 \\ 61 & 10^{1} S8 \\ 58 & -15=26 \\ 61 & 10^{1} S8 \\ 58 & -15=26 \\ 71 & 10^{1} S8 \\ 71 & 10^{1} S$	-(1, E0, 27) 60 + 10 + 47
$ \begin{array}{c} 51 & -\frac{1126}{112} \\ & 60 & 10 & 58 \\ \hline 52 & -8 & 21 \\ & 60 & 10 & 58 \\ \hline 53 & -8 & 21 \\ & -60 & 10 & 58 \\ \hline 54 & -8 & 21 \\ \hline & -60 & 10 & 58 \\ \hline 55 & -48 & 27 \\ \hline & -60 & 10 & 58 \\ \hline & 58 & -56 & (1) & -5(1+5))76 & 5 \\ \hline & -61 & 28 & -76 & (8-5))76 & 5 \\ \hline & -61 & 28 & -76 & (8-5))76 & 5 \\ \hline & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -76 & -7$	F(I.GE. 51)60 10 42
$\begin{array}{c} 50 \text{ TO } 58 \\ 52 \text{ W=11} \\ \hline & & & & & & & & \\ \hline & & & & & & & &$	-= <u>6</u>
$ \begin{array}{c} 32 & p = 1 \\ & - 0 & 0 & 58 \\ \hline & - 0 & 10 & 58 \\ \hline & - 60 & 10 & 58 \\ \hline & - 60 & 10 & 58 \\ \hline & - 60 & 70 & 58 \\ \hline & - 55 & - 826 \\ \hline & - 60 & 70 & 58 \\ \hline & - 56 & - 826 \\ \hline & - 60 & 70 & 58 \\ \hline & - 56 & - 826 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - (1 - P) & 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 76 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 & - 71 \\ \hline & - 71 & - 71 \\ $	10.28
53 = 16 $60 = 10 = 58$ $54 = 521$ $60 = 10 = 58$ $55 = 4526$ $60 = 10 = 58$ $56 = 4531$ $58 = 6 = (5(1) - 5(1+5))76$ $F = (1 - p + p)76$ $F = (1 - p) + (1 - (1 - p) + (1 - p))76$ $F = (1 - p) + p + p + (1 - p) + p + y + y + (1 - p - p) + p + y + y + (1 - p - p) + p + y + y + (1 - p - p) + p + y + y + (1 - p - p) + p + y + y + (1 - p - p) + p + y + y + (1 - p - p) + p + y + y + (1 - p - p) + p + y + y + (1 - p - p) + p + y + y + (1 - p - p) + p + y + y + (1 - p - p) + p + y + (1 - p - p) + p + y + (1 - p - p) + p + y + (1 - p - p) + p + y + (1 - p - p) + p + y + (1 - p - p) + p + y + (1 - p - p) + p + y + (1 - p - p) + p + y + (1 - p - p) + p + y + (1 - p - p) + p + y + (1 - p - p) + p + y + (1 - p - p) + p + y + (1 - p - p - p) + p + y + (1 - p - p - p + p + y + p + (1 - p - p - p + p + y + p + (1 - p - p + p + p + p + p + p + y + y + (1 - p - p + p + p + p + p + y + y + (1 - p + p + p + p + p + p + y + y + (1 - p + p + p + p + p + y + p + y + p + y + p + y + p + p$	-11
$ \begin{array}{c} 60 & 10^{\circ} 58 \\ 54 & 521 \\ \hline 60 & 10^{\circ} 58 \\ 55 & 8=26 \\ \hline 61^{\circ} 10^{\circ} 58 \\ 56 & 8=31 \\ 58 & P=(5(1)-5(R-5))70.5 \\ \hline F1=P+(1-P+P)76 \\ F1=(1-P)*(1-(1-P)*(1-P))76 \\ \hline BE(1)=(1-P)*PF(E=5)+EE(R)-E1*DELTA(R)-F1*DELTA(M-5) \\ 47 & ALPRA(1)=RE(1)-S(1)72 \\ \hline D0^{\circ} 8 M=1,35,2 \\ \hline R & V(R)=(4+(ALPRA(1)-R+R)7S(1)) \\ \hline C(3)=176(3) \\ MK=3 \\ \hline IF(ABS(CG(3)).CT.1)G(T(0^{\circ} 9) \\ \hline \end{array} $	= 1 (;
$54 - 5=21$ $60^{\circ} + 10^{\circ} + 58^{\circ}$ $55 - 58^{\circ} + 58^{\circ}$ $56 - 68=31$ $58 - 6^{\circ} + 58^{\circ} + (1-9*7)76^{\circ}$ $f + 1=(1-9)*(1-(1-9)*(1-9))76^{\circ}$ $F + 1=(1-9)*(1-(1-9)*(1-(1-9))76^{\circ}$ $F + 1=(1-9)*(1-(1-9))76^{\circ}$ $F + 1=(1-9)*(1-(1-9))*(1-(1-9))76^{\circ}$ $F + 1=(1-9)*(1-(1-9))*(1-(1-9))76^{\circ}$ $F + 1=(1-9)*(1-(1-9))*(1-(1-9))*(1-(1-9))*(1-(1-9))*(1-(1-9))*(1-(1-9))*(1-(1-9))*(1-(1-9))*(1-(1-9))*(1-(1-9))*(1-(1-9))*($	<u> 10 58</u>
$ \frac{60}{55} = \frac{10}{58} $ $ \frac{55}{6} = \frac{10}{58} $ $ \frac{56}{6} = \frac{10}{57} $ $ \frac{56}{6} = \frac{10}{$	-21
60 T0 58         56 M=31         58 P=(S(1)-S(H-5))70.5         £1=F*(1-P*P)76         F1=(1-P)*(1-(1-P)*(1-P))76         BE(1)=(1-P)*PF(K=5)+P*BE(H)-E1*DELTA(H)-F1*DELTA(H=5)         47 A)PHA(1)=RE(J)-S(1)72         D0 3 M=1,35,2         8 V(H)=C*(ALPHA(D)-H*E)7S(1)         6(3)=V(1)+1         H(3)=176(3)         H1=H(3)         MX=3         1F(ABS(G(3)).CT.1)KH T0 9	-26
$56  M=31$ $58  P=(S(1)-S(H-5))76.5$ $f_1=P*((1-P)*P76$ $F_1=(1-P)*PF(K-5)+P*B((H)-F1*DELTA(H)-F1*DELTA(H-5)$ $47  A).PHA(1)=BE(T)-S(1)72$ $B0  S = 1,35.2$ $8  V(H)=4*(ALP IA(1)-H*H)7S(1)$ $6 (3) = V(1)+1$ $H (3)=176(3)$ $H1=H (3)$ $Mk=3$ $IF(ABS(6(3)).CT.1)60  (0.9)$	<u>Σ ΤΟ 58</u>
58	= 31
$E_{1} = P + (1 - P + P) / 6$ $F_{1} = (1 - P) + (1 - P) + (1 - P) + (1 - P) / 6$ $B_{E}(1) = (1 - P) + P + (M - 5) + P + B_{E}(H) - F_{1} + DF_{L} + A(H) - F_{1} + DF_{L} + DF$	2 = (S(1) - S(11 - 5)) / 0.5
BF(1)=(1-p)*(1-(1-p)*(1-p))/6 BF(1)=(1-p)*(1-(1-p)*(1-p))/6 47 AlpHA(1)=HE(1)-S(1)/2 D(3 M=1,35,2 8 V(M)=4*(ALPHA(1)-H*H)/S(1) 6(3)=V(1)+1 H(3)=176(3) H1=H(3) MK=3 IF(ABS(6(3)).CT.1)60 T(0 9 	1 = P * (1 - P * P) / 6
47       A1.pHA(1)=RE(1)-S(1)72         p0       3 M=1,35,2         8       V(M)=4*(ALPHA(1)-H*D)/S(1)         6(3)=V(1)+1         H(3)=176(3)         H1=H(3)         MK=3         1 F(ABS(G(3)).UT.1)G0 Y0 9	(1)=(1-P)*(1-P)*(1-P))(0
$ \begin{array}{c}                                     $	284(1)=8E(1)-S(1)/2
$ \frac{8}{(3) = 4 + (A \perp P \parallel A (1) - \parallel + 1) / S (1)} \\ = 6 (3) = V(1) + 1 \\ = H (3) = 1 / 6 (3) \\ = 1 / 6 (3) \\ = 1 / 6 (3) \\ = 1 / 6 (3) / (1) + 1 / (3) \\ = 1 / 6 (3) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / (1) / $	8 M=1,35,2
$F_{n}(3) = W(1) + 1$ $H(3) = 1/G(3)$ $M(x=3)$ $I = (ASS(G(3)) \cdot CT \cdot 1) \cdot G(T_{0}) \cdot 9$	$(M) = 4 \times (ALPHA(1) - H \times H) / S(1)$
П1=H(3) M(=3 IF(ABS(G(3)).LT.1)GП ТО 9 	5) = 1/6(3)
MK=3 IF(ABS(G(3)).CT.1)50 Y0 9	=#(3)
	= 3
	(ABS(G(3)), LT.1)60 TO 9

書意			ار از میکند. مرکز میکند از معنور میکند از معنور میکند.
	, J		
		100 7 M=5,21,2	
		6(N) = V(N-2) - H(N-2)	
		P(F) = 1/G(F)	
			······
		96(35)=1/y(35)	
		H(35) = V(35)	
1	<b> </b>	10 -10 N=2,35-MK-2,2	
		H(35-M)=V(35-M)-G(37-M)	
1.		$10^{-6}(35-M)=17E(35-P)$	
		H(MK)=V(MK)-G(MK+2)	
		WRTTE(2,203)(G(F),14=3,35,2)	
		WRITE(2,203)(H(H),M=3,35,2)	
1 -		203 FURMAT(1x,4DS0.20)	
	1.	IF(AES(H1-K(MK))1E-10)89,80,81	
		$\frac{\delta I}{H2 + 0.08} + \frac{\delta (2.200) h I}{h (9.6)}$	
		$\frac{1}{1} = \frac{1}{1} \left( \frac{1}{1} + 1$	
÷.	į.	$\frac{1}{1 + 1} = \frac{1}{1 + 1} = $	
1 N . 1		DO 23 M = 5.MK.2	مرد المراجعة المحمولية المحمولة والمعادية المحمول المحمول المحمول المحمول المحمول
	4	23  FREM(M) = H(F) * H(F) * (1 + FREM(M-2))	
4		$\frac{21}{5} \frac{5}{5} \frac{1}{11} = 1 + \frac{1}{10} (13) + \frac{1}{10} (13)$	
	4	DO 22 H=4,13-14K,2	ada ah ya ya ya ya kuta kuta kuta kuta ya ay
3		22  SRFM(13-M) = 1 + 6(13-M+2) + 6(13-M+2) + SREM(13-M+2)	
· ^		. H(MK)=(FREM(MK)*H2+SREP(MK)*U1)7(FREM(MK)+SREM(MK))	
	9	ERROR=(R1-b2)/(FRFM(MK)+SREM(ME))	
	•	DO 23 N=1:K+2, MK+8,2	
	•	$\frac{23}{6(4)=6(4)-ERROR*(SREE(1,-2)-1)}$	
	•	IF(NK.EQ.5)60 10 25	
		$\frac{1}{26} \frac{1}{100} \frac{1}{$	
فنجتع		$\frac{25}{25} = \frac{1}{1000} + \frac{1}$	
		$\frac{2}{1000} = 1000000000000000000000000000000000000$	
	1	WRTTF(2,203)(H(N),1)=3,(12,2)	• • • • • • • • • • • • • • • • • • •
1.		$\frac{80}{100}$ B (16 K) = 1.0	
		p0 76 M=2, MX+1,2	
		78  P(PK-M) = P(PK-M+2) + H(MK-M+2)	an na man da an
1		D() 14 P=HK, 33.2	
in .	ŀ	14 B(M+2) = B(M) + G(M+2)	
- Aller		A = P(1)	
		DO 11 M=3,35.2	
		11 A=A+H*B(M)	
	4	1  10  10  1.35.2	
, Aurelia	1.	$\frac{1}{10} \frac{10}{10} \frac{1}{10} $	
	al iteration .	$\frac{2}{2} \frac{2}{2} \frac{2}{1} \frac{2}{2} \frac{1}{1} \frac{2}{1} \frac{1}{1} \frac{1}$	
Street of the	*	UPITE(2,001)	
	1	4 901 FORMATCH , 11X, 18X, 18X, 2HZL, 17X, 485F01, 17X, 605F0ASE)	
	-17		a and a second
	1.	·	۵۰۰۰۰ «۱۹۹۵»» و معرود میدود بر وارد ۵۰ ۵۰۰۱ بر ایرو در معرود میرود. ا
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The second s	1		
1442	-		
,	1	ار این	
	4		

	شع ا		
. /	للتعمد	X(1) = SORT(S(1))	
	4	71(1) = F21(X(1))	
		SE(1)=0.	
		GF(1) = FGE(S(1))	
		SEDASH(1) = SGRT(S(1)) / GE(1)	
		URITE(2,900)X(1),21(1),SE(1),SEDASE(1)	
	•	DU ZU J=1,49	
	Ĵ	71(1+1)=271(3(1+1))	
		SF(J+1) = FSF(Y(J+1))	<u> </u>
		SEDASH(J+1) = FSODASH(X(J+1))	
		URITE(2,900)X(J+1),ZI(J+1),SE(J+1),SEDASE(J+1)	
		-900 FORMAT(1H ,4E20.8)	•
		IF(SEDASH(J+1))40,41,20	
		40  CED(1) = SEEASH(J)	
		$CFD(2) \approx SEDASB(J+1)$	
		Y(1) = X(j)	
		Y(Z)=>(J+1)	
		$\frac{1}{1} = \frac{1}{1} = \frac{1}$	
	I	(1) = Y(1+2)	
and		CED(L+2)=FSODASE(Y(1+2))	
à		IF (ARS(CED(L+Z))1E-08)42,42,6	
		6 IF(L.EC.1X) DRITE(2,904) U(I), CED(L+2)	
		904 FORMATCH , VALUE OU SEDASH IS NOT ACCURATE', 2E20.10)	
		5 CONTINUE	
		<u>60 TO 42</u>	
		$\frac{41}{12} = \frac{1}{12} = \frac{1}{12}$	
	]	42 = E(1) = SOF(1)S(1) = O(1) + CSOF(S)DT(S) = E(1) + E(1)SN	*** - ******
. •		$\frac{1}{1}$ URITE(2,902)	<b></b> ,
		902 FORMAT(14, 2X, 4PS, 12X, 104, 18X, 1HF, 14X, 1)HEIGENVALUE)	
-			
	.	WRITE(2,903)S(1),U(1),E(1),EIGENVALUE(1)	****
		WRITE(2,903)S(1),U(1),E(1),EIGENVALUE(1) 903 FORMAT(1H ,F5.2,3E20.8)	
		WRITE(2,903)S(I),W(I),E(I),EIGENVALOE(I) 903 FORMAT(IH,F5.2,3E20.8) 60 TO 30	······································
		WRITE(2,903)S(1),U(1),E(1),EIGENVALOE(1) 903 FORMAT(1H ,F5.2,3E20.8) GO TO SO 20 CONTINUE	· · · · · · · · · · · · · · · · · · ·
Lateration of the second s		WRITE(2,903)S(I),U(I),E(I),EIGENVALOE(I) 903 FORMAT(IH,F5.2,3E20.8) GO TO 30 20 CONTINUE 30 CONTINUE STOP	· · · · · · · · · · · · · · · · · · ·
		WRITE(2,903)S(I),U(I),E(I),EIGENVALOE(I) 903 FORMAT(IH,F5.2,3E20.8) GO TO SO 20 CONTINUE 30 CONTINUE STOP END	
(a) A strategy in the second secon	ر	WRITE(2,903)S(1),U(1),E(1),EIGENVALOE(1) 903 FORMAT(1H,F5.2,3E20.8) GO TO 30 20 CONTINUE 30 CONTINUE STOP END FUNCTION FZI(X)	
(1) Y. A. Sharak "Assumption of Section and Assumption Section 2014.	م المتقدمين من المتقدمين المتقدمين المتقدمين من المتقدمين المتقدمين المتقدمين المتقدمين المتقدمين المتقدمين الم 	WRITE(2,903)S(I),U(I),E(I),EIGENVALOE(I) 903 FORMAT(IH,F5.2,3E20.8) GO TO 30 20 CONTINUE 30 CONTINUE STOP END FUNCTION FZI(X) COMMON S(50), PE(50,50), L, PI	
and the second se Second second	موجع می می باد. منابع می می باد. - مستقل می	<pre>WRITE(2,903)S(I),U(I),E(I),EIGENVALOE(I) 905 FORMAT(IH,F5.2,3E20.8) G0 T0 S0 20 CONTINUE 30 CONTINUE STOP END FUNCTION FZI(X) COMMON \$(50),PE(50,50),I,PI FZI=ACOSH(X/SORT(S(I)))</pre>	
1. A statement of the statement of th	م در محمد من محمد شریع به محمد و با محمد از محمد محمد محمد محمد محمد محمد محمد محم	WRITE(2,903)S(1),U(1),E(1),EIGENVALOE(1) 903 FORMAT(1),F5.2,3E20.8) GO TO 30 20 CONTINUE 30 CONTINUE STOP END FUNCTION FZI(X) COMMON S(50),DE(50,50),L,PI FZI=ACOSH(X/SORT(S(1))) RETURN	
1. A manual interface of the same particular interface of the same provided in the same set of the same set	ر. به به موجود	WRITE(2,903)S(I),U(I),E(I),EIGENVALUE(I) 905 FORMAT(1H,F5.2,SE20.8) GO TO 30 20 CONTINUE STOP END FUNCTION FZI(X) COMMON S(50),PE(50,50),I,PI FZI=ACOSH(X/SGRT(S(I))) RETURN END	
ار این از این از این از این از این این از این		<pre>WRITE(2,903)S(1),U(1),E(1),EIGENVALUE(1) 903 FORMAT(1H,F5.2,3E20.3) G0 T0 30 20 CONTINUE 30 CONTINUE STOP END FUNCTION FZI(X) COMMON S(50),PE(50,50),L,PI FZI=ACOSH(X/SORT(S(1))) RETURN END FUNCTION FSE(X)</pre>	
الله الله الله الله الله الله الله الله	د. مایند. میکند. میکند. به میکند میکند. میکند تواند با میکند. با میکند. با میکند با میکند. با میکند. میکند. با مایند. این میکند. میکند با میکند. میکند. میکند. میکند. میکند. میکند. با میکند. میکند. میکند. با میکند. میکند. م	<pre>WRITE(2,903)S(I),W(I),E(I),EIGENVALOF(I) 903 FORMAT(IH ,F5.2,3E20.8) G0 T0 S0 20 CONTINUE SJ CONTINUE STOP END FUNCTION FZI(X) COMMON S(50),DE(50,50),L,PI FZI=ACOSH(X/SORT(S(I))) RETURN END FUNCTION FSE(X) COMMON S(50),DE(50,50),L,PI FUNCTION FSE(X) FUNCTION FS</pre>	
(a) A first of the second statement of the second statement is a second statement of the second sta	والمعاولين والمحافظ والمحافظ والمحافظ المحافظ والمحافظ والم	<pre>WPITE(2,963)S(1),U(1),E(1),EIGENVALOE(1) 903 FORMAT(1),FS.2,3E20.8) G0 TO 30 20 CONTINUE 30 CONTINUE STOP END FUNCTION FZI(X) COMMON S(56),DE(50,50),I,PI FZI=ACOSH(X/SORT(S(1))) RETURN END FUNCTION FSE(X) COMMON S(50),DE(50,50),I,PI DIMENSION S0(50),RJ(200) 21=FZ((X)</pre>	
(4) A standard structure for some med men att standard standard structure at an att standard standard structure at a standard structure at a Standard structure at a standard s	مانستان می مورد با با ماند	<pre>WRITE(2,963)S(I),W(I),E(I),EIGENVALUE(I) 905 FORMAI(IH,F5.2,3E20.8) 60 TO 30 20 CONTINUE 3J CONTINUE STOP END FUNCTION FZI(X) COMMON S(56),PE(50,50),I,PI FZI=ACOSH(X7SORT(S(I))) RETURN END FUNCTION FSE(X) COMMON S(56),DF(50,50),I,PI DIMENSION S0(56),RJ(200) ZI=FZI(X) CALL DUZO1(X,35,RJ,0,1E-09,IEP)</pre>	
(1) A standard standard for the standard standa Standard standard stand Standard standard stand Standard standard stand Standard standard s Standard standard stand Standard standard stand Standard standard stand Standard standard stand Standard standard standard standard standard standard standard standar	ر می موسوق می موسوق می باشد. موسوق می موسوق می مو موسوق می موسوق می موس	<pre>WRITE(2,903)S(1),W(1),E(1),EIGENVALUE(1) 903 FORMAT(1H,F5.2,3E20.8) G0 TO 30 20 CONTINUE 30 CONTINUE STOP END FUNCTION FZI(X) COMMON S(50),PE(30,50),L,PI FZI=ACOSH(X/SORT(S(1))) RETURN END FUNCTION FSE(X) COMMON S(50),DE(50,50),L,PI DIMENSION S0(50),NJ(200) ZI=FZI(X) CALL DW701(X,35,FJ,0.1E-09,IEE) S0(1)=DE(1,1)*BJ(Z)</pre>	
1. – Viener in der Kannen mit Ander Sternen im Sternen in der Sternen im der Sternen in der Sternen im der Ster 1. – Ander Sternen im der Sternen im Sternen im Sternen im Sternen im der Sternen im der Sternen im der Sternen 1. – Ander Sternen im St	ب من	<pre>WRITE(2,903)S(1),U(1),E(1),EIGENVALUE(1) 903 FORMAT(1H ,F5.2,5E20.8) GO TO 30 20 CONTINUE 30 CONTINUE STOP END FUNCTION FZI(X) COMMON S(50),DE(50,50),L,PI FZI=ACOSH(X7SORT(S(1))) RETURN END FUNCTION FSE(X) COMMON S(50),DE(50,50),L,PI DIMENSION S0(50),RJ(200) XI=FZI(X) CALL D0701(X.35,FJ,0.1F-09,IEP) S0(1)=DE(1,1)*BJ(2)</pre>	
1. – 1. Served a starting for a second structure of a second structure of the second structure of the second st Second structure of the second structure of the second structure of the second structure of the second structure Second structure of the second structure of the second structure of the second structure of the second structure	ب محمد المحمد المحم محمد المحمد ا	<pre>WRITE(2,903)S(1),U(1),E(1),EIGENVALOP(1) 903 FORMAT(1H,F5.2,3E20.8) 60 TO 30 20 CONTINUE 3J CONTINUE STOP END FUNCTION FZI(X) COMMON S(50),DF(50,50),1,PI FZI=ACOSH(X7SORT(S(1))) RETORN END FUNCTION FSE(X) COMMON S(50),DF(50,50),1,PI DIMENSION S0(50),RJ(200) ZI=FZI(X) CALL DOTOT(X.35,FJ,0.1F=09,TEP) S0(1)=DF(1,1)*BJ(2)</pre>	
1. – Vietnes industrie fan de gebruik wie de ferste inder werden de ferste inder de ferste inder de ferste die Bester inder de ferste die de ferste inder de ferste die de ferste die de ferste die de ferste die de ferste di Bester inder die	ب ما مارستان می از این مارستان این مارستان در مارد به مارستان در موارد این مارستان این مارستان این مارستان مار مارستان مارستان	<pre>WPITE(2,963)S(1),U(1),E(1),EIGENVALOE(1) 905 FORMAT(1) ,F5.2,3E20.8) G0 T0 30 20 CONTINUE 3J CONTINUE STOP END FUNCTION FZI(X) COMMON \$(50),PE(50,50),1,PT FZI=ACOSH(X/SORT(S(1))) RETURN END FUNCTION FSE(X) COMMON \$(50),DE(50,50),1,PT DIMENSION \$(50),DE(50,50),1,PT DIMENSION \$(50),DE(50,50),1,PT DIMENSION \$(50),DE(50,50),1,PT DIMENSION \$(50),DE(50,50),1,PT DIMENSION \$(50),DE(50,50),1,PT DIMENSION \$(50),DE(50,50),1,PT DIMENSION \$(50),DE(50,50),1,PT DIMENSION \$(50),DE(50,50),1,PT SO(1)=DE(1,1)*BJ(2) </pre>	
1999 – Al Annae Annae Sanaa marana ana amin'ny fananana amin'ny fanana amin'ny fanana amin'ny fanana amin'ny fa Na amin'ny fanana mandra mandra mandra mandra amin'ny fanana amin'ny fanana amin'ny fanana amin'ny fanana amin' Ana amin'ny fanana	ب ما تعلق من محمد محمد محمد محمد محمد محمد محمد م	<pre>WRITE(2,903)S(1),U(1),E(1),EIGENVALUE(1) 905 FORMAT(1H ,F5.2,3E20.8) 60 TO SU 20 CONTINUE 3J CONTINUE STOP END FUNCTION F71(X) COMMON S(S0),PE(S0,50),I,PT FZI=ACOSH(XZSORT(S(1))) RETURN END FUNCTION FSE(X) COMMON S(S0),DF(S0,50),I,PT DIMENSION S0(S0),RJ(200) ZI=FZI(X) CALL D0701(X.35,PJ,0.1F-09,TEP) S0(1)=DE((7))XHJ(Z)</pre>	
1. – Viene statute from and an and an an an an and a statute statute statute of the statute of the statute of t 1. – 1. – 1. – 1. – 1. – 1. – 1. – 1. –	ب المستقدمين المراقبة المحتمدين المحتمدين المحتمد المحتم المحتمد المحتمد	<pre>WPITE(2,903)S(1),U(1),F(1),FIGENVALUE(1) 905 FORMAT(1)F,F5.2,3E20.8) 60 TO 30 20 CONTINUE 30 CONTINUE 30 CONTINUE STOP END FUNCTION FZI(X) COMMON S(50),DF(50,50),L,PI FZI=ACOSH(X7SORT(S(1))) RETURN END FUNCTION FSE(X) COMMON S(50),DF(50,50),L,PI DIMENSION SO(50),RJ(200) XI=FZI(X) CALL D0701(X:35,NJ,0.1F=09,IEP) SO(1)=DF(1,1)*BJ(2)</pre>	
an an ann an an ann an ann an ann an ann an a	، به مانت مانت مانت مانت مانت مانت مانت مانت	<pre>WRITE(2,963)S(1),U(1),E(1),EIGENVALUE(1) 905 FORMAT(1H ,F5.2,3E20.8) G0 TO 30 20 CONTINUE SJD CONTINUE STOP EMD FUNCTION FZI(X) CONDOR S(SC),PE(50,50),L,PI FZ1=ACOSH(X7SGHT(S(T))) RETURN END FUNCTION FSE(X) COMMAN S(SC),DE(50,50),L,PI DIMENSION S(SC),RJ(20H) Z1=FZ1(X) CALL D0761(X.35,FJ,0,1F-09,TEP) S0(1)=DE(1,1)*UJ(2) </pre>	
1999年,一次1999年1月1日,1999年1月1日,1999年1月1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1 1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日,1999年1日	، ما	<pre>WRITE(2,9G3)S(1),U(1),E(1),FIGERVALUE(1) 905 FORMAN(1),F5.2,3E20.0) G0 T0 S0 G0 T0 S0 20 CONTINUE S10 FUNCTION FZI(X) COMMON S(50),FE(50,50),I,P1 FZI=ACOSH(X7SORT(S(1))) RETURN END FUNCTION FSE(X) COMMON S(50),DE(50,50),I,P1 DIMENSION S0(50),RJ(200) ZI=FZI(X) CALL D0701(X.35,FJ,0.1F-09,TEP) S0(1)=DE(I,1)*BJ(Z)</pre>	
	ر مانستان میرد. میرد میرد میرد میرد میرد میرد میرد میرد	<pre>WPITE(2,903)S(1),E(1),E(1),EIGENVALUE(1) 905 FORMAT(1) ,FS.2,3E20.8) G0 TO SU 20 CONTINUE 30 CONTINUE STOP END FUNCTION FZI(X) COMMON S(S0),DE(50,50),I,P1 FZIEACOSH(X7SORT(S(1))) RETURN END FUNCTION FSE(X) COMMON S(S0),DE(50,50),I,P1 DIMENSION S0(50),RJ(20D) ZI=FZI(X) CALL DOTO1(X.35,PJ,0.1F-09,TER) SO(1)=CE(1,1)*HJ(Z)</pre>	
	a second and a second second second and a second	ωριτε(2,963)S(1), ω(1), ε(1), ειδεννλισε(1)             ωσι κοπλη (1μ, ε5.2,3ε23.3)         GO το 30         Fill	
	والمستقلم المستقل المستقلية المستقلية ومستقل المستقلية والمستقل المستقل ال	<pre>WP1TE(2,903)S(1),U(1),E(1),FIGENVALOP(1) 903 F0RAD1(1) ,FS.2,3E20.8) 60 TO S0 20 CONTINUE S10P END FUNCTION F7I(X) COMBON S(S0),DF(20,50),1,P1 F21=ACOSH(X7SGHT(S(1))) RETURN END FUNCTION FSE(X) COMMIN S(S0),DF(50,50),1,P1 DIMENSION S0(S0),RJ(200) Z1=FZ1(X) CALL D0701(X:35,FJ,0,1F-09,TER) S0(1)=DE((T,1))*BJ(Z) </pre>	
	ب ما توسیق می بود. می مان م مان مان مان مان مان مان مان مان مان مان	<pre>WPITE(2,963)S(1),U(1),E(1),ETGENVALOP(1) Y03 FARMA1(1H,F5.2,3E20.8) G0 T0 S0 20 CONTINUE S10 CONTINUE S10 CONTINUE S10 CONTINUE COMMON FZI(X) COMMON S(S67,DF(50,50),1,P1 FZI=ACOSH(X7SGRT(S(T))) RETURN END FUNCTION FSE(X) COMMON S(S67,DF(50,50),1,P1 DIMENSION S0(S0),DF(50,50),1,P1 DIMENSION S0(S0),DF(50,50),1,P1 DIMENSION S0(S0),DI(200) Z1=FZI(X) S0(1)=DE((T,1)*BJ(Z) AUX AUX AUX AUX AUX AUX AUX AUX</pre>	
	ب مانت مانت می مانت می مانت می مانت می 	<pre>WF17E(2,063)S(1),U(1),F(1),F1GERVALOF(1) 905 F0R#A1(1H,F5.2,3E20.8) 60 Y0 S0 20 CONTINUE 3J CONTINUE STOP ERD FUNCTION F21(X) COMMON S(S6),FF(30,50),L,P1 F21=ACOSH(X7S0RT(S(1))) RETORN END FUNCTION FSE(3) COMMON S(S6),DF(50,50),L,P1 D1MEASION S0(50),RJ(200) 21=F21(X) COMMON S(S5,PJ,0,1F=09,TER) S0(1)=0F(1,1)+EJ(2) </pre>	
	م مستقل معني من		

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	p(1 + 6 + 5 + 2) + 2 E S (DE (1 + E)) + 2 + 2 E S (DE (1 + E)) + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 +
	$= \frac{1}{10000000000000000000000000000000000$
1	RETURN
	END
1	FUNCTION FSCDASPCX)
ļ	DIVENSION SOL(SO), BJ(200)
	COMMON S(50), DE(50,50), L, P1
3	$\chi_1 = FZ_1(\chi)$
:	CALL D0701(X,35,FJ,0.1E-09,TER)
4	$S(I_{1}) = 0E(1,1) * (BJ(1) - BJ(S))$
•	אין איז
1	Ο ΕΥΡΟΕΙΧΑΙ Ε Ε ΕΠΑΕΝ-ΕΕΖΕΙΣΤΑΝΤΙΤΙΤΟΕΝΤΙΤΑΤΙΣΑ ΕΣΕΠΟΤΙΟΤΙΕΣΤΙΤΑΤΟ ΔΕΤΝΗΤΖΤΙ 
	1 TANH(71)¥\$61(70)
1	RETURN
1	E i D
	FUNCTION FGE(X)
-}	COUMON S(50), DE(50, 50), 1, PI
	DIMENSION SOL(50)
	SOL(1) = OF(1,1)
	$p_0 \leq k = 3, 29, 2$
	$\frac{6}{6} = SOL(k-2) + ABS(BE(1,k))$
	$\frac{F6E = S0RT(2/PI) * 2 * S0L(29) / DE(1,1)}{EE = 100}$
1	KF108P
	CURDAUTINE DOZDACY & FLA IEDA
	AIMENSION FICODEN
ļ	0 = A
	1 - 00 - 4 - x = 1,200
1	4 BJ(K)=0.0
ļ	$\gamma = \chi$
	1 F (() 1, 2, 40
	2 + 1 + 1 = 1 = 1
	RETURN
	$1 \qquad X = -X$
	$\frac{40}{15}$
	N = N + 1
	COMPART OF ADDITING VALUE OF B
1	
ļ	(C(X - AN) - 20.20.21)
1	20 M7FRU=N+10
1	6670 74
	21 MZERO=X+20
	74 MMAX=199
	100 00 190 P=MZERO, MMAX, 3
	OVERFLOW TRAP BASED ON 1.870
and a substitute of	
	1 22 X 0 0 1 0 = 5 X 0 (ALOG(1, E - 70) 7 10)
	25 X0010=FXP(AL06(1.E=70)710)
	25 X0919=FX9(AL0G(1.E=70)710)
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			1+(X0)-X0(+TN)22,22,130
•			66 (1797) D=10
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1	1. 	-	60 10 23
1.		. -	SET F(M), F(M-1)
			130 BJ(#+1)=0.
1	•	·	BJ(#)=1.0E-70
		·	
	and and a		100 100 N=11PC 
Į	Card Line		160 BJ (KK) = 2.* KK +BJ (FK+4)73-BU (FK+2)
1	, i Maria in		SIM=-BJ(1)
	(norther sector)	*	00 161 K=1,F,2
			161 SUM=2.0*8J(K)+SUM
1		1. 1	00 - 162 = 1.14
	•		$\frac{100}{100} = \frac{100}{100} = $
			190 BPREVEBJ(01)
		_	JER=199
			10 IF(Y-X) 201,200,201
-			201 D6 202 K=2, M, 2
and an			202  BJ(K) = -EJ(K)
1		1	EVV KETURA.
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	1		MASTER 0J9
1		-	COMMON SCADY DECADERATV, 6, H7 FREM7 SREM7 K17H2, A7B
			DUMENSION BE(60), ALPHA(60), V(ΚΟΥ, ΚΥΚΗΥ, ΗΥΚΟΥ ΥΥΔΟΛΥ ΖΤΥΔΕΩΥ
- I HANK		1-	1SEDASH(100); W(60); E(60); EIGENVALUE(60); CFD(20); Y(20); R(60);
		1 <u>1</u>	2 FREM(30); SREM(60); T(64); BFT(60); SF(100); GE(60)
4			PI=3.1415926536
	Ţ.	1	= 101 = 000  at (5(1), 101) ((S(1), 7E(1)), 7E(1), 34)
		ì	101 FURPAILED.Z/F12.8)
		1	READATIFE 5. F12-89
		-	b0-50-1=1,55
	-		JF(1.LE.34)60 T0 47
<b>1</b>			S(I) = 1/T(I)/T(I)
1	: ]	".   :	BE(1) = BET(1) + 17 + SORT(S(1))
1 :	1		47  ALPHA(I) = RE(I) - S(I) / 2
		. i.	$c = y(r) - 4\pi (RL r R (1) - R \pi r) / S(1)$
· ·	*		H(3) = 1/G(3)
, <sup>1</sup> ,			H1=H(3)
			Μκ=3
	-		JF(ABS(G(3)).UT.1)G0 10 9
-			0074=5,21,2
a mination	a ver		$P_{M} = P(M-S) - H(M-S)$
<b>j</b>	j.		H(ih) = 1/6(ih)
			n I - N (H-2) Mk=N-2
al and	14 16		LLF(ABS(G(H)))]T_1750_T0_9
Â.	ان	1	7 CONTINUE
		-	96(51) = 177(51)
~,	م.	1	H(51)=V(51)
	. •		DO 10 M=2,51-MK-2,2
	-		H(51-M) = V(51-M) - 6(53-M)
	دالمعنا	]	10.5(51-M)=1/H(51-M)
	متسانس	1	$\frac{1}{1} = \frac{1}{1} + \frac{1}$
		. ]	WRITE(7,203) (678) - MEX - 81 - 21
ETN			$\frac{1}{1} = \frac{1}{1} = \frac{1}$
1			203 FORMAT (1x, 4030, 20)
			IF (ABS (H1-H(MK))1E-10)80.80.81
	in a subscript		81 WRITE(2,203)H1,H(MK)
		****	H5=H(WK)
			FREM(3)=H(3)*H(3)
		-	LECHK. EQ. 5360 TO 21
1	1		28 EDEMINISTRY TO THE TARA
1		• •	21 SPEN(MK+10)=1+R(WK+10)+20(M-2))
-	124		
1911	1 1 1		22 SREM(MX+12-M)=1+6(MX+12-M)+6CMX+12-MT+CDFM(MX+10-MT+C)
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#C(W) = C(+) F(W(W) > H2 = S(F) F(H) > T(H) Y (F) F(H)(W) > S(F) F(H)(X) > S(F) F(W) > F(W) = S(F) = S(		
H(WK)= (FH(HK) +HZ+SPFK(HC)TH(T) / (TREPK(HK)+SPFH(HK)) ENR/UNE (H1-K2) / (FREM(LK)+SPFH(HC)) D0 23 K = W+2; (W+5, 2; 23 G(H) = 6(P) = FR(DH + (SREH(K=2)=1) <sup></sup>		
$ \begin{array}{c} (1) & (1) & (1) & (1) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) & (2) $		
D0 25 % H + + 2 (W + 5 (2)         23 6 (0) = 6 (x) - FR00 + 6 RED (K + 22) = 1) **         B0 26 ¥ = 5 (W , 2)         b0 26 ¥ = 5 (W , 2)         c (M) = ((x) - FR00 + 6 RED (K + 2) **         c (M) = ((x) - FR00 + 6 RED (K + 2) **         c (M) = ((x) - FR00 + 6 RED (K + 2) **         c (M) = ((x) - FR00 + 6 RED (K + 2) **         c (M + 1) ** <td (m="" **<="" +="" 2)="" t<="" td=""><td></td></td>	<td></td>	
23 G (M) 26 (F) - F R Q (D + (S R E A (F 2) - 1) 		
1       1         0       2       F         2       F       H(M) = H(M) - ERPORT FREIS(M)         2       S       H(M) = H(M) - ERPORT FREIS(M)         2       S       H(M) = H(M) - ERPORT FREIS(M)         2       S       H(M) = H(M) - ERPORT FREIS(M)         3       S       H(M) = H(M) - ERPORT FREIS(M)         8       R       H(M) = H(M) - ERPORT FREIS(M)         8       R       H(M) = H(M) - H(		
26 - 10(4) = H(X) = E(P)OP XF FEF(P)  25 - H(4)X = H = NROP K FEF(P)  WR ITE (2,203) (G(W) (M = FX + 2.7)K + 8,2)  WR ITE (2,203) (G(W) (M = FX + 2.7)K + 8,2)  WR ITE (2,203) (G(W) (M = FX + 2.7)K + 8,2)  WR ITE (2,203) (G(W) (M = FX + 2.7)K + 8,2)  D = 10 - 74 + 2.8 K + -1.2  T = 0 - 74 + 2.8 K + -1.2  D = 10 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  D = 10 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 2.8 K + -1.2  M = 0 - 74 + 1.4 K + 2.0 (2)  M = 0 - 2.0 - 2.1 + 7.4 K + 2.0 (2)  M = 0 - 2.0 - 2.1 + 7.4 K + 2.0 (2)  M = 0 - 2.0 - 2.1 + 7.4 K + 2.0 (2)  M = 0 - 2.0 - 2.1 + 7.4 K + 2.0 (2)  M = 0 - 2.0 - 2.1 + 7.4 K + 2.0 (2)  M = 0 - 2.0 - 2.0 - 2.0 K + 0.0		
25 H (4K) = H (+ F R (0K) * F (F (H)) WR IT (C (2 203) (G (K ) T (+ E Y + 2 T (K + 3 T 2)) G (H (Y) = T (2 - 203) (G (K ) T (+ 2 T (K + 3 T 2)) B (H (Y) = T (2 - 203) (G (K ) T (+ 2 - 2)) T (0 - 7 (K + 2 ) = 0 (H (+ K + 2) + H (K (- K + 2))) D (1 - K + K + 5 (T - 2)) A = B (1)		
<pre>NHTE(22)203)(H(P))=3/BK72) 80(R(NK)=1,2) 80(R(NK)=1,2) 80(R(NK)=1,2) 7E(B(NK)=R(X)=R(NK)=R(2)) 7E(B(NK)=R(2))=8(NK)=R(2)) 7E(B(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2)) 7E(B(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(2))=8(NK)=R(</pre>		
$ \frac{80}{8} (8 \times 5) = 1.0 $ $ \frac{80}{8} (8 \times 5) = 1.0 $ $ \frac{80}{8} (8 \times 5) = 0.0 $ $ \frac{80}{8} (8 \times 6) =$		
D 0 / 8 F=2, K<1, 2 7 E B (M × H) = D (M × H × 2) × H (K K - K + 2) D T 14 '' F = H × 3 T 2 14 '' B (M × 2) = R (R) × 6 (P + 2) A = 8 (1) D 0 11 V = 3, 51 , 2 11 'A = A+W & R(M) P 0 16 V = 1, 51 , 2 12 '' D C (I, M) = B (F) / A W I T E (2, 201 ) (D E (I, K) 7 F = 1, H1 , 2) 201 'F OR KAT (I H , 11 X, 1 H X, 1 S X, 2 H 2 T, 1 7 X, 4 H S E 0 7, 1 7 X, 6 H S E D X S H) X (I) = S G E I (S (I)) 21 (I) = F S (I X (I)) S E (J) = F S (I X (I)) S E (J) = F S (I X (I)) O O (F OR KAT (I H , 7 H X, 1 S X, 2 H 2 T, 1 7 X, 4 H S E 0 7, 1 7 X, 6 H S E D X S H) X (I) = S G E I (S (I)) S E (J) = F S (I X (I)) S E (J) = S F S (I X (I)) S E (J) = S F S (I X (I)) S E (J) = S F S (I X (I)) S E (J) = S F S (I X (I)) S E (J + 1) = F S (I X (I) + 1) X (I (J + 1)) S E (J + 1) , S E D X S H (J + 1) S E (J + 1) = F S (I X (J + 1)) S (I (J + 1)) S E (J + 1) , S E D X S H (J + 1)) S E (J + 1) = F S (I X (J + 1)) S (I (J + 1)) S E (J + 1) , S E D X S H (J + 1)) S E (J + 1) = F S (I X (J + 1)) S (I (J + 1)) S E (J + 1) , S E D X S H (J + 1) S (I (J + 1)) S (I		
D0 14 P=HK/S172 14 2 E(H) 2 = E(H) X6 (P+2) A=B(1) D0 11 V = 3/5172 11 A= A+H+R (M) D0 16 P=1.5172 16 DE (L, M) = E(F)/A WR ITE (2, COM) 90 F COREAT (1H, 71X, 1HX, 1SX, 2H2T, 17X, 4ESE09, 17X, 6HSE0ASH) X (1) = SORT (S(1)) 21 (1) = F(1) (X(1)) SEC(1) = C GE (1) = C GE (1) = C GE (1) = SORT (S(1)) / SEC(1) = SC(1) + SC(1) + SC(1) VE TTE (2, 7060) X(1), 2T(17, 5F (17), 5EDASH(15)) 00 G F CORAT (1H, 7420, E) D0 2 D 1 = 7, 40 X (1+1) = F(1) (X(1+1)) SEC(1) = C Z (1 + 1) = F(1) (X(1+1)) SEC(1) = C Z (1 + 1) = F(1) (X(1+1)) SEC(1) = C Z (1 + 1) = F(1) (X(1+1)) SEC(1) = SORT (X(1)) SEC(1) = SOTT (X(1)) SEC(1) =		
14 8(4+2) = 0(1) × 6(0+2) A = 8(1) D = 11 × 23,51,2 11 A = A+WAR(M) D = 0 + 6 + 3,51,2 14 D = 6(1, M) = 8(P)/A WR ITE (2,201) (D = (1, K),7F = 1, M1,2) 201 F ORMAT (14,7AE20,10) WR ITE (2,201) (D = (1, K),7F = 1, M1,2) 201 F ORMAT (14,7AE20,10) WR ITE (2,201) (D = (1, K),7F = 1, M1,2) 2(1) = 50 + (3(1)) 901 F ORMAT (14, 7, HX, 15X,2H2T, 17X,4F SE00,17X,6H SEDASH) X (1) = 50 + (3(1)) SE 0,58 + (1) = 50 + (3(1)) SE 0,58 + (1) = 50 + (3(1)) 900 F ORMAT (14, 4E20,8) D = 20 + 1,49 X (1+1) = 52 + (3(1+1)) SE 0,58 + (1) = 50 + (3(1)) SE 0,58 + (1) = 1 + (3(1+1)) WR ITE (2,200,0) × (1+1), 2 + (3(1+1)) WR ITE (2,200,0) × (1+1), 2 + (3(1+1)) WR ITE (2,200,0) × (1+1), 2 + (3(1+1)) VR ITE (2,200,0) × (1+1), 2 + (3(1+1)) + (3(1+1)) VR ITE (2,200,0) × (1+1), 2 + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1)) + (3(1+1))		
A=3(1) D 11 P = 3,5172 11 A=A+W&R (M) D 16 F=1,5172 16 D 16 F=1,5172 17 D 16 F=1,5172 201 FORMAT(1X,74E20.10) WR TTE(2,201) 901 FORMAT(1X,74E20.10) V(T) = SORT(5(T)) 21(1) = F2((X(1)) SE(1) = F3(F(T)) SE(1) = F3(F(T)		
11 A = A + W + R (M) D0 16 F = 1;51;2 16 D E (1, M) = B (C) / A WE IT E (2, 201) (DE (1, M), F = T, H1;2) 201 FORMAT (1X; A E 20:10) WE IT E (2, 201) 901 FORMAT (1H - 11X; 1HX; 1SX; 2H2T; 17X; 4HSE09; 17X; 6HSEDASH) X (1) = SORT (S (1)) 21(1) = F 21 (X(1)) SE(1) = F 0 E (S (1)) SE(1) = F 0 E (S (1)) (S E 0 A SH (1) = SORT (S (1)) / GE (1) * S(1) * S(1) * S(1) * S(1) WE IT E (2, 900) X (1); 21(1), SE (1) * S(1) * S(1) * S(1) WE IT E (2, 900) X (1); 21(1), SE (1) * S(1) * S(1) * S(1) WE IT E (2, 900) X (1); 21(1), SE (1) * S(1) * S(1) * S(1) SE 0 A SH (1) = A G RT (S (1)) / GE (1) * S(1) * S(1) * S(1) * S(1) SE (1) = F C (X (1) + 1); 21(1); 21(1); SE 0 A SH (1) 000 FORMAT (1H - 4E 20:E) D (2) = 1; A9 X (1+1) = F Z (1X (1+1)) SE 0 A SH (1+1) = F S 0 0 A SH (X (1+1)) SE 0 A SH (1+1) = F S 0 0 A SH (X (1+1)) SE 0 A SH (1+1) = F S 0 0 A SH (X (1+1)) SE 0 A SH (1+1) = F S 0 0 A SH (X (1+1)) WH IT E (2, 900) X (1) = 1; 1; 1; 1; 1; 1; 1; 1; 1; 1; 1; 1; 1;		
D0 16 F = 1, 51, 2 16 DE (1, R) = B (R) / A WR 11E (2, 201) (DE (1, K), F = 1, H1, 2) 201 FORMAT (1%, AE 20, 10) WR 11E (2, 901) 901 FORMAT (1%, AE 20, 10) X (1) = SORT (S (1)) X (1) = SORT (S (1)) X (1) = SORT (S (1)) SE(1) = G GF (1) = FGE (S (1)) SE(1) = G GF (1) = FGE (S (1)) VWF 1FE (2, 906) X (1), 2 ((1), SF (1), SF (1), ST (1), ST (1)) WF 1FE (2, 906) X (1), 2 ((1), SF (1), SE (1)) 900 FORMAT (1H, AE 20, E) D0 20 J = 1, 49 X (1+1) = X (J) + 0.50 21 (J+1) = F2 T (X (J+1)) SE (J+1) = F2 T (X (J+1)) SE (J+1) = F2 F (X (J+1)) SE (J+1) = F2 F (X (J+1)) SE (J+1) = F2 F (X (J+1)) CED (L+2) = FA SH (J) CED (2) = SE DASH (J) CED (2) = SE DASH (J) Y (1) = X (J) D0 5 (= 1, 18 Y (1+2) = F (Y (1+1) * CED (1) - Y (1) * CED (L+1)) 7 (CED (1) - CED (L+1)) W (1) = Y (L+2) T F (AUS (CED (L+2)) 1F - GR) 42, 42, 6 F (X, L) = (SE DASH (J) - Y (1) * CED (L+2)) Y (1) = Y (L+2) T F (AUS (CED (L+2)) 1F - GR) 42, 42, 6 F (X, L) = (SE DASH (J) - Y (1) * CED (L+2) 904 FORMAT (1X, * VALUE OF SED ASH IS NOT ACCURATE * . ZE 20.10) 5 CONTINUE		
<pre>VELTE (2, 201) (DE(1)k); F=1, N1; 2) 201 FORMAT (17, AF20, 10) WELTE (2, 201) 901 FORMAT (18, 714X, 14X, 15X, 242T, 17X, 445E09; 17X, 645E0A5H) X(1) = SORT(S(1)) Z1(1) = F21(X(1)) SE(1) = 0. GF(1) = F6E(S(1)) SE(1) = 0. SE(1) = 0. SE(1</pre>	· · · · · · · · · · · · · · · · · · ·	
201 FORMAT(1X, AE20.10) WRITE(2,001) 901 FORMAT(1W, T1X, T1X, T1X, T1X, 2H2T, T7X, 4HSE09, T7X, 6HSEDASH) X(1) = SORT(S(I)) Z1(1) = F2I(X(1)) SE(1) = F2I(X(1)) SE(1) = F3E(S(I)) SE(1) = F3E(S(I)) / EE(1) = S(I) + S(I) + S(I) + S(I) + S(I)) SE(1) = F3E(X(1), ZI(1), SE(I) + S(I) + S(I) + S(I) + S(I)) 900 FORMAT(1H, AE20, E) 900 FORMAT(1H, AE20, E) 900 FORMAT(1X, VALUE OF S(I), SE(I) + S(I)		
WRITE(2,901) 901 FORMAT(1H: 11X,1HX,1SX,2H2T,17X,4HSE09717X,6HSEDASH) X(1) = SORY(S(1)) 21(1) = F2I(X(1)) SE(1) = ORTA(1) = SORT(S(1)) / OE(1) = S(1) =		
<pre>X(1) = SORT(S(1)) Z1(1) = F2T(X(1)) SE(1) = SOPASH(1)) SE(1) = SOPASH(1) SE(1) = SOPASH(1) = SOPA</pre>		
21(1)=F2T(X(1)) SE(1)=0. GF(1)=FGETS(T) SE DASH(1)=SORT(S(T))/GET(1)+S(T)+S(T)+S(T)+S(T) WRITE(2:000)X(1),ZT(1),SF(T),SF(DASH(1)) 900 FORMAT(1H,4E20.8) DO 20 3=1749 X(J+1)=FX(J)+0.50 Z1(J+1)=FZT(X(J+1)) SE 0ASH(J+1)=FSE(X(J+1)) SE 0ASH(J+1)=FSE(X(J+1)) WRITE(2,000)X(J+T),ZT(J+T),SE(J+T),SEDASH(J+T) TF(SE0ASH(J+1))+0,4T,20 40 CED(1)=SF0ASH(J) CED(2)=SEDASH(J+1) V(1)=X(J) Y(2)=X(J+1) DO 5(=1,148 Y(1+2)=(Y(1+1)+CED(1)-Y(T)+CED(L+T)))7(CED(T)-CED(T+T)) CED(L+2)=FSUDASH(Y((L+2))) W(1)=Y(L+2) TF(AUS(CED(L+2))1F-08)42,42,6 6 JF(X,E0,TS)WRTE(2,9CA)W(T)-CED(T+2) 904 FORMAT(1X,'YALUE OF SEDASH IS NOT ACCURATE',2E20.10) 5 CONTINUE		
SE(1)=0. GF(1)=FGE(S(1)) SEDASH(1)=SGRT(S(1))/GE(1)+S(1)+S(1)+S(1)+S(1) WPITE(2,900)X(1),ZT(1),SF(1),STDASH(1) 900"FORMAT(1H*,4E20.8) DG 20"J=1,49 X(J+1)=X(J)+0.50 Z1(J+1)=FZT(X(J+1)) SEDASH(J+1)=FSC(X(J+1)) WRITE(2,900)X(J+1),ZT(J+1),SE(J+1),SEDASH(J+1) IF(SEDASH(J+1))40,41,20 40 CED(1)=SFDASH(J) CED(2)=SEDASH(J) CED(2)=SEDASH(J) Y(1)=X(J) Y(2)=X(J+1) D0 5 (=1,18 Y(1+2)=FS(DASH(Y(1+2))) W(1)=Y(L+2) IF(AUSC(FD(L+2))-IF-08)42,42,6 6 JF(X,E0,18)WRTE(2,964)W(C),CED(L+2) 904 FORMAT(1X,'VALUE OF SEDASH IS NOT ACCURATE',ZE20.10) 5 CONTINUE		
SEDASH(1)=SGRT(S(I))/GE(I)*S(I)*S(I)*S(I)*S(I) WRITE(2,900)X(1),ZI(1),SF(I),SEDASH(1) 900 FORMAT(1H,74220:8) D0 20 J=1;49 X(J+1)=x(J)*0.50 Z1(J+1)=FZT(X(J+1)) SE(J+1)=FZT(X(J+1)) WRITE(2,900)X(J+1),ZT(J+1),SE(J+1),SEDASH(J+1) IF(SEDASH(J+1))40;41,20 40 CED(1)=SFDASH(J) CED(2)=SEDASH(J+1) Y(1)=X(J) Y(1)=X(J) Y(1)=X(J) Y(1)=X(J) Y(1)=X(J) Y(1)=X(J) W(I)=Y(L+2)=FSHASH(Y(L+2)) W(I)=Y(L+2)=FSHASH(Y(L+2)) W(I)=Y(L+2)=FSHASH(Y(L+2)) W(I)=Y(L+2)=FSHASH(Y(L+2)) SCONTINUE 40 CED(1)=SEDASH(Z)=1F-08342;42;6 5 CONTINUE		
<pre>WRITE(2,900)X(1),Z(1),SE(1),SEDASH(1) 900 FORMAT(1H',4E20.8) D0 20 J=1,49 X(J+1)=X(J)+0.50 Z1(J+1)=FX(X(J+1)) SE(J+1)=FX(X(J+1)) SE(J+1)=FXE(X(J+1)) WRITE(2,900)X(J+1),Z1(J+1),SE(J+1),SEDASH(J+1) IF(SEDASH(J+1))A0,41,20 40 CED(1)=SFDASH(J) CED(2)=SEDASH(J) CED(2)=SEDASH(J) Y(1)=X(J) Y(1)=X(J) Y(1)=X(J) Y(1+2)=(Y(1+1)*CED(1)-Y(1)*CED(L+1))Y(CED(1)-CED(L+1)) CED(L+2)=FSUDASH(Y(L+2)) W(I)=Y(L+2) IF(AUS(CFD(L+2))1F-03)42,42,6 6 IF(X,E0,1S)WRITE(2)9C4)U(D),CED(L+2) 904 FORMAT(1X,'VALUE OF SEDASH IS NOT ACCURATE',ZE20.10) S CONTINUE</pre>		
000 FORMAT(IF, 4220.6)         D6 20 J=1749         X(J+1)=x(J)+0.50         21(J+1)=F2T(X(J+1))         SEDASH(J+1)=FSODASH(X(J+1))         WRITE(2,900)X(J+1),2T(J+1),SE(J+1),SEDASH(J+1)         IF(SEDASH(J+1))40,41,20         40 CED(1)=SEDASH(J)         CED(2)=SEDASH(J+1)         Y(1)=X(J)         Y(1)=X(J)         Y(1)=X(J)         Y(1+2)=(Y(1+1)+CED(1)-Y(1)+CED(1+1))7(CED(1)-CED(1+1))         CED(1)=SEDASH(Y(1+2))         Y(1+2)=(Y(1+1)+CED(1)-Y(1)+CED(1+1))7(CED(1)-CED(1+1))         CED(1+2)=FSODASH(Y(1+2))         W(I)=Y(1+2)         IF(ABS(CED(1+2))1F-0B)42,42,6         6         IF(ABS(CED(1+2))1F-0B)42,42,6         1         1		
<pre>X(J+1)=x(J)+0.50 Z1(J+1)=F2T(X(J+1)) SE(J+1)=F2E(X(J+1)) WRITE(2,900)X(J+1),ZT(J+1),SE(J+1),SEDASH(J+1) HF(SEDASH(J+1))40,41,20 40 CED(1)=SFDASH(J) CED(2)=SEDASH(J+1) Y(1)=X(J) Y(1)=X(J) Y(1)=X(J) D0 5 (=1,18 Y(1+2)=(Y(1+1)*CED(1)-Y(1)*CED(1+1))7(CED(1)-CED(1+1)) CED(1+2)=FSODASHCY(1+2)) W(I)=Y(L+2) IF(ABS(CFD(1+2))1F-08)42,42,6 6 JF(X.E0.18)WRITE(2,904)W(I)7CED(1+2) 904 FORMAT(1X,'VALUE OF SEDASH IS MOT ACCURATE',2E2D.10) 5 CONTINUE</pre>		
<pre>21(J+1)=FZT(X(J+1)) SE(J+1)=FSE(X(J+1)) WRITE(2,000)X(J+1),ZT(J+1),SE(J+1),SEDASH(J+1) IF(SEDASH(J+1))40,41,20 40 CED(1)=SEDASH(J) CED(2)=SEDASH(J+1) Y(1)=X(J) Y(2)=X(J+1) 00 S (=1,18 Y(1+2)=(Y(1+1)*CED(1)-Y(1)*CED(L+1))7(CED(1)-CED(1+1)) CED(L+2)=FSODASH(Y(L+2)) W(1)=Y(L+2) IF(AUS(CFD(L+2))1F-08)42,42,6 6 JF(X.E0,1S)WRITE(2,904)U(C);CED(L+2) 904 FORMAT(1X,'VALUE OF SEDASH IS NOT ACCURATE';ZE20.10) 5 CONTINUE</pre>		
SEDASH(J+1)=FSODASH(X(J+1)) WRITE(2,900)X(J+1),ZT(J+1),SE(J+1),SEDASH(J+1) IF(SEDASH(J+1))40,41,20 40 CED(1)=SFDASH(J) CED(2)=SEDASH(J+1) Y(1)=X(J) Y(1)=X(J) Y(2)=X(J+1) 00 5 [=1,18 Y(1+2)=(Y(1+1)*CED(1)-Y(1)*CED(L+1))7(CED(1)-CED(L+1)) CED(L+2)=FSODASH(Y(L+2)) w(L)=Y(L+2) IF(ABS(CFD(L+2))=.1F-08)42,42,6 6 IF(X.E0.18)WRITE(2,904)W(D);CED(L+2) 904 FORMAT(1X,'VALUE OF SEDASH IS NOT ACCURATE';ZE20.10) 5 CONTINUE	· · · · · · · · · · · · · · · · · · ·	
<pre>WRITE(2,900)X(J+1),21(J+1),SE(J+1),SEDASH(J+1) IF(SEDASH(J+1))40,41,20 40 CED(1)=SEDASH(J) CED(2)=SEDASH(J+1) Y(1)=X(J) Y(2)=X(J+1) Y(1)=X(J) Y(2)=X(J+1) Y(1)=X(L+1)*CED(1)-Y(1)*CED(L+1))7(CED(1)-CED(L+1)) CED(L+2)=FSUDASH(Y(L+2)) W(I)=Y(L+2) IF(ABS(CFD(L+2))1F-08)42,42,6 5 IF(X.E0.1S)WRTTE(2,904)W(I).CED(L+2) 904 FORMAT(1X,'VALUE OF SEDASH IS NOT ACCURATE'.ZEZD.10) 5 CONTINUE </pre>		
<pre>1 F ( SE D A SH ( J + 1 ) 40, 41, 20 40 ( E D ( 1 ) = SF D A SH ( J + 1 )</pre>		
CED(2)=SEDASH(J+1) Y(1)=X(J) Y(2)=X(J+1) DO 5 (=1,18 Y(1+2)=(Y(1+1)*CED(1)-Y(1)*CED(L+1))7(CED(1)-CED(L+1)) CED(L+2)=FSUDASH(Y(L+2)) W(1)=Y(L+2) TF(ABS(CFD(L+2))1F-08)42,42,6 6 JF(X.EQ.1S)WRITE(2,964)W(1)7CED(L+2) 904 FORMAT(1X,'VALUE OF SEDASH IS MOT ACCURATE'7ZE20.10) 5 CONTINUE		
Y (1) = X (J) Y (2) = X (J+1) D0 5 (=1,18 Y (1+2) = (Y (L+1) * CED (1) - Y (1) * CED (L+1))7 (CED (1) - CED (L+1)) CED (L+2) = FSUDASH (Y (L+2)) W(I) = Y (L+2) IF (AUS (CFD (L+2))1F - 08)42,42,6 6 JF (X.E0.18) WRITE (2,904) W(I), CED (L+2) 904 FORMAT(1X, 'VALUE OF SEDASH IS NOT ACCURATE', ZE20.10) 5 CONTINUE		
DO 5 (=1,18 Y(1+2) = (Y(1+1)*CED(1) - Y(1)*CED(L+1))7(CED(1) - CED(L+1)) CED(L+2) = FSUDASH(Y(L+2)) W(1) = Y(L+2) TF(ABS(CFD(L+2))1F-08)42,42,6 6 JF(K.E0.18)WRTTE(2,904)U(1)7CED(L+2) 904 FORMAT(1X,'VALUE OF SEDASH IS NOT ACCURATE'.ZE20.10) 5 CONTINUE	······································	
Y(L+2) = (Y(L+1)*CED(1)-Y(1)*CED(L+1))7(CED(1)-CED(L+1)) CED(L+2) = FSODASH(Y(L+2)) W(I) = Y(L+2) IF(AUS(CFD(L+2))1F-08)42,42,6 6 JF(K.E0.18)WHTTE(2,904)W(I),CED(L+2) 904 FORMAT(1X,'VALUE OF SEDASH IS NOT ACCURATE',ZE20.10) 5 CONTINUE 1		
CED(L+2) = FSODASH(Y(L+2)) W(I) = Y(L+2) IF(ABS(CFD(L+2)) = .1F=08)42,42,6 6 JF(K.EQ.18)WRTTE(2,904)U(I).CED(L+2) 904 FORMAT(1X, 'VALUE OF SEDASH IS NOT ACCURATE'.ZE20.10) 5 CONTINUE 		
IF(ABS(CFD(L+2))1F-08)42,42,6       6       1F(K.EQ.18)WRITE(2,904)W(D).CED(L+2)       904       FORMAT(1X, 'VALUE OF SEDASH IS NOT ACCURATE'.ZE20.10)       5       CONTINUE		
6 JF(K.EQ.18)WRTTE(2,904)W(D),CED(L+2) 904 FORMAT(1X, VALUE OF SEDASH IS NOT ACCURATE 7,2E20.10) 5 CONTINUE		
904 FORMATCIX, VALUE OF SEDASH IS NOT ACCURATE, ZEZO.10)		

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1. S	1	
		<u>60 TU 42</u>
		$41 \ \text{W}(1) = X(J+1)$
		$\frac{1}{2} = \frac{1}{2} $
	с. Г	$- \frac{1}{10000000000000000000000000000000000$
	۰.	
		= WRITE(2,903)S(1),W(1),F(1),F(1),F(1)
	· .	
11		<u></u>
		20 CONTINUE
		30 CONTINUE
		STOP.
	· ·	FONCTOR FZI(X)
		$F_{T} = d(\Delta S R (XT S G R T (S(T))))$
	- 1	RETURN
		END
		FUNCTION FSE(X)
		COMMON S(80), DF(60,60), 1, PT
		DIMENSION S0(60), BJ(200)
		ZI = FZJ(X)
		CALL DG(U)(X, D)(BJ, AE + 10, IER) = E + E + E + E + E + E + E + E + E + E
		$SU(1) = U_{1}(1) = U_{2}(1) = U_{2}(1)$
		SO(5) = SO(3) + S + OF(1 + S) + SU(0)
		SO(7) = SO(5) - 7 + DE(1,7) + BJ(6)
		50(9) = 50(7) + 9 * 0F(1,9) * BJ(10)
31.5313/J		p0 6 K=11,39,2
		$\frac{6}{80(K) = SO(K-2) + K + ABS(DE(1,K)) + BJ(K+1)}$
•••••		x = 39
•		FSE= SGRI(P1/2)*IA00(X)
		FUNCTION FSODASH(X)
		COMMON S(60), DE(60,60), I, PI
		DIMENSION SOL(80), BJ(200)
		Z1=FZ1(X)
		CALL D0701(X,57,BJ, 18-10,1ER)
		SOL(1) = 9E(1,1) * (BJ(1) - BJ(3))
	į	$\frac{501(57+501(17+5*0E(175)*(6J(57+BJ(57)))}{60175Y+601(3Y+5+BE(T,5Y+6)(2T(5Y+BJ(57)))}$
	1	30(7) - 30(3) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30(7) - 30
	4 · .	$SOL(9) \approx SOL(7) + 9 * DE(1,9) * (BJ(9) - BJ(11))$
		00 8 K=11,39,2
	į	8 SOL( $k$ ) = SOL( $k-2$ ) + $k*ABS(DE(I,K)) * (BJ(K)-BJ(K+2))$
1		SE=FSF(X)
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-Test		The second s
		RETURN
	1	
•	÷	COMMON S(60), DE(60, 60), J, PT
1	9	DIMENSION SOL(60)
		SOL(1) = OE(1,1) SOL(3) = SOL(1) = OE(1,3)
		sol(5) = sol(3) + bF(1,5)
	••	SOL(7) = SOL(5) - DE(1,7)
	•	- 00 6  K=11,39,2
1		6  SOL(K) = SOL(K-2) + ABS(PE(1, E))
- 11	· -	RETURN
		DIMENSION BJ(200)
		$D \equiv A$
		$\begin{array}{c} 0.0 & 4 & K=1,200 \\ \hline 4 & RI(K)=0.0 \end{array}$
		$Y = \chi$
		F(X) = 1, 2, 40
		RETURN
		$1 \qquad X = -X$
	-	$\frac{100 \text{ M} \times 100}{\text{N1} = \text{N} + 1}$
		BPREV = .0
	•	AN=N
		IF(X-AN) 20,20,21
•	•	$\frac{20}{60}$ $\frac{10}{74}$
arter de		21 MZERG=X+20
		$\frac{74 \text{ M}(\text{A}\text{X}=199)}{100 \text{ DO} 190 \text{ M}=\text{MZERO, MMAX, 3}}$
		COVERFLOW TRAP BASED ON 1.E70
i de la comercia de l La comercia de la come		$\frac{23 \times 0MIN = EXP(ALOG(1, E-70)/M)}{XOM = X/M}$
		LF(X0M-X0MIN)22,22,130
		22  M = M - 3
	· ·	
		60 TO 23
		130  BJ(M+1)=0.
-		BJ(P) = 1.0E - 70
		00 160 K=1,M2
1		WK = M - K
	- 	4
	3	
	1	
	1	
	5	
÷	\$	
· · 160 BJ(MK)=2.\* MK \*BJ(MK+1)/X-BJ(MK+2) SUM=-BJ(1) D0 161 x=1,M,2 161 SUM=2.0\*BJ(K)+SUM D0 162 K=1,M  $\frac{162}{162} = BJ(K) = BJ(K) / SUM$  IF(ABS(EJ(N1) - BPREV) - ABS(D\*BJ(N1))) = 10,10,190TER=199 -----= 201 00 202 K=2,M,2 200 RETURN END FINISH - ----

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		والمراجع المستحديثية مواسحت بالمراجع تحاد مستلح فيمته منتع أمتك التي مؤهدية التعاديعية ماستحاط المستمر	a an
		MASIER LCMU 07 DIMENSION X(70),Y(70),XL(7),Y	(L(7), FUN(7,7)
-		M=59	
14.5	9	$\frac{1}{100} = \frac{1}{100} = \frac{1}$	1)
	1 1	- x1=0.1	
		x 2 = 0.2	***************************************
		x 5=0, 5 x 4=0, 4	
l í	andre u	x 5 = 0 . 5	ν <sup>*</sup>
		$x_{6=0.6}$	
		x8=0.8	
		xy = 0, y	
		$\frac{10=0.93}{0.01} = 1.7$	
1 ×		×L(T)=×(T)-×1	
	1	YU(1) = Y(1)	
1		$\frac{5-x}{90}$ t $\frac{5-x}{30}$	
		92 00 2 1=1,7	
		X = X = X = X = X = X = X = X = X = X =	
	-	S = X 2	
, ,		XE(1)=X(1+4)-X3	
		3 YL(1)=Y(1+4)	
		$\frac{5 = x  3}{6  0 = 1  0 = 3  0}$	
·	- -	94 D0 4 I=1,7	
-	•	$X_{1}(1) = X(1+10) - X'_{4}$	
रसम्बद्	aj J	S = X 4	
1		<u>60 TO 30</u>	
		95  00  5  1=1,7 X + (1) = X (1+17) = X 5	
		5 Y L(1) = Y ((+17))	
	-	$S \neq XS$	
3		96 00 6 1=1,7	
	-	x = x = x = x = x = x = x = x = x = x =	
		$c = \gamma((1) = \gamma(1 + 24))$ S = X 6	
		GO TO 30	· · · · · · · · · · · · · · · · · · ·
	i i	97 D0 7 $1=1,7$ x1(1)=x(1+31)=x7	
	-	7 YE(I)=Y(I+31)	
		S = X7	
		-	
	+		
	-		
	14 A.		

		98 00 8 (=1.7
	•	= XL(1) = X(1+38) = X8
		8 YL(1)=Y(1+38)
		S # X 8
+		(0, y) = (0, y) = (0, y) (1) = $(0, y) = (0, y)$ (1) = $(0, y) = (0, y)$
	• -	9 - YU(1) = Y(1 + 45)
		S = X 9
	-	GO TU 30
	•	995 00 10 1=1.7
		$\frac{\chi(1) = \chi(1 + 5\chi) - \chi(1)}{\chi(1 + 5\chi) - \chi(1 + 5\chi)}$
and a state of the		, IV YECTD-YET+327 ,
Ŷ		30 CALL INTER (XL, YL, FUN)
		WRITE(2,200)S
	- ,	200 FORMAT(1x,'E=',F3.1)
		1.0[=1
	• .	
er huud	•	20 - WRITE(2/201)(FUR(J,1),1-:,(UL-J+1) 201 FORMAT(AE20.8)
		ES = FUN(7,1) * FUN(7,1) * S * S / SOFT(1,-S * S)
	•.	WRITE(2,202)ES
	·	202 FORMAT(1X, 'S', '=', F20.8)
		IF(S.FG.X1)60 TC 92
		1F(5,E0,X2)50 TU 93
19 10 11 10		$\frac{1}{1} = \frac{1}{1} = \frac{1}$
283.2×1		IF(S,EQ,X5)60 TO 96
		IF(S.FQ.X6)60 TO 97
+- · - ·		IF(S.EQ.X7)60 TG 98
		TF(S.EG.X8)60 TO 99
		1 1F(5,F9,AV)60 10 995
		END
		SUBROUTINE INTER(X,Y,F)
		DIMENSION X(7), Y(7), F(7,7)
		DO 80 1=1,6
		$\frac{1}{10080} = 0.000000000000000000000000000000000$
		$\frac{11}{10} \frac{11}{10} 11$
		70 A = x (1 + 1)
1		C = X (T)
	·.	$B = Y \left( 1 + J \right)$
원 건		$b = \lambda(1)$
		$\frac{\chi(1+J)=0}{\chi(1)-\lambda}$
		$\frac{1}{\sqrt{1+1}} = 0$
and the second se	4	$\frac{\gamma(1)=0}{\gamma(1)=0}$
A H	[	80 CONTINUE
Ţ		
	}	
	<b>)</b>	
	*	
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 NO
 10
 I=1,7

 10
 F(1,I)=Y(I)

 IUL=7

 DO
 9
 J=2,IUL

 DO
 9
 I=1,JUL=J+1

 -9
 F(J,I)=(X(J+J-1)\*F(J-1)F(J-1)F(J-1)F(J-1)F(X(I))F(X(I+J-1)-X(I))

"RETURN" ---- END ---FINTSH E S ÷  $\sim$ · · · · · - CHARD 

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## ORGANISATION OF COMPRESSOR NOISE STUDY.





## CRITICAL WAVE-LENGTHS OF WAVES IN ELLIPTICAL PIPES.

Here the H-curves are the critical magnetic wavelengths and E-curves are the critical electrical wavelengths. Thus oH 1 and eH 1 are respectively odd and even curves of order one. <sub>e</sub> <sup>H</sup> is an even curve of order zero.







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Figure 4 - (

e = 0.6

e = 0.7 Figure 4 - (vii)





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(mode = 2)



(mode = 2)







(mode = 8)



(mode = 15)



(mode = 15)









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(mode = 8)



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Odd Radial Pressure Functions of Lowest Cross-mode in an Elliptic Duct. (mode = 15)









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## Figure 11 (b)



## (mode = 15)















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