FACULTY OF SCIENCE

DEPARTMENT OF APPLIED PHYSICS AND ENGINEERING
MATHEMATICS

B. TECH IN: EMERGENCY MEDICAL CARE AND PODIATRY

MODULE:    PHY 1ALT AND PHY 1BAA1

CAMPUS:    DFC

**JUNE EXAMINATION 2014**

DATE: 31st May 2014                         SESSION: 8H30 – 10H30

ASSESSOR: Dr L. Reddy                       MARKS: 100

INTERNAL MODERATOR: Mr T. Mathe

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Number of pages:  9 pages, including the information sheet

**Instructions**:    Calculators are permitted

**Requirements**: UJ multiple choice answer sheet

                One answer script per student

**Instructions**:   Answer SECTION A in full in the answer script provided

                Answer SECTION B in the UJ multiple choice answer sheet
                provided

                Place the multiple choice answer sheet inside the answer script

## Section A – answer in full

### Question One

1. State or define

   1.1 a resultant vector (2)

   1.2 Newton's 1st law of motion (3)

   1.3 Efficiency of a machine (2)

   1.4 Law of conservation of energy (3)

### Question Two

2.1 Define: the actual mechanical advantage of a machine (2)

2.2 The diameters of the upper pulleys of a <u>differential pulley system</u> are 40 cm and 50 cm respectively. If a force of 500 N is required to lift a load of 2000 N, calculate the machine's

2.2.1 Ideal mechanical advantage

2.2.2 Actual mechanical advantage, and

2.2.3 Efficiency (6)

### Question Three

3.1 Define power (2)

3.2 An electric motor is used to pump 300 kg of water per minute from a river to a dam situated 40 m above the water level in the river. If 50% of the energy provided by the motor is effectively used to transfer the water, calculate the power of the motor. (5)

### Question Four

4.1 State Archimedes' principle for floating bodies (3)

4.2 An alloy has a mass of 50 kg in air and 40 kg when immersed in water. Calculate the

4.2.1 Weight of the body (2)

4.2.2 Weight loss of the body in water (2)

4.2.3 RD of the alloy (2)

4.2.4 Object's weight if it floats in another liquid (2)

4.2.5 Density of the alloy (2)

4.2.6 Volume of the displaced liquid (2)

[20]

## Section B –multiple choice

1. A vector bearing of $210^0$ cannot be described as

   A. $30^0$ S of W

   B. S $30^0$ W

   C. $30^0$ W of S

   D. $60^0$ S of W

2. Which of the following pairs are both scalar quantities?

   A. Energy and force

   B. Speed and mass

   C. Temperature and velocity

   D. Density and acceleration

3. A train is travelling at a speed of 90 km h$^{-1}$. Brakes are applied so as to produce a uniform acceleration of -0.5 m/s$^2$. Find how far the train will go before it is brought to stop.

   A. 425 m

   B. 325 m

   C. 625 m

D. 725 m

4. A man travels for the first 800 km of a 1000 km trip in 8 hours. If his average speed for the whole trip is to be 100 km h$^{-1}$, then he should travel the last 200 km at

   A. 200 km h$^{-1}$

   B. 111 km h$^{-1}$

   C. 100 km h$^{-1}$

   D. 500 km h$^{-1}$

5. The unit in which work is measured can be written as

   A. kg m s$^{-2}$

   B. N s

   C. W s

   D. N m$^{-1}$

6. A ball is thrown in the upward direction with a velocity of 9.8 m/s. After what time will the ball reach its maximum height?

   A. 0.8 sec

   B. 1 sec

   C. 2 sec

   D. 4 sec

7. A machine does 2500 J of work in 1 minute. What is the power developed by the machine?

   A. 420 W

   B. 42 W

   C. 150 W

   D. 21 W

8. What happens to the total energy of a moving object if all the applied forces are conserved?

   A. It increases

   B. It decreases

   C. It remains constant

   D. Velocity and altitude is required to answer this question

9. A force of 200 N is required to lift a load of 600 N in a <u>block and tackle</u> system consisting of 6 pulleys. The efficiency of this system is

   A.  66 %

   B.  40 %

   C.  50 %

   D.  33 %

10. A jackscrew has a lever arm of 60 cm and a pitch of 0.6 cm. What will be the actual mechanical advantage (AMA) of the system if it has an efficiency of 40 %?

   A. 101.50

   B. 206.20

   C. 151.43

   D. 251.43

11. Ideal mechanical advantage (IMA) of a machine is given by the ratio

   A. $\dfrac{load}{effort}$

   B. $\dfrac{effort}{load}$

   C. $\dfrac{distance\ moved\ by\ the\ effort\ F}{distance\ moved\ by\ the\ load\ W}$

   D. $\dfrac{distance\ moved\ by\ the\ load\ W}{distance\ moved\ by\ the\ effort\ F}$

12. The relative density of lead is 11.309. What will be the density of lead?

   A. 11309 g cm$^{-3}$

   B. 11309 kg m$^{-3}$

   C. 11.309 kg m$^{-3}$

   D. 0.011309 kg m$^{-3}$

13. Consider an object to be floating on oil, then according to Archimedes' principle, the weight loss of the object will be

   A. Equal to the weight of the object in air

   B. Equal to the weight of equal volumes of water

   C. Equal to the amount of oil displaced

   D. None of the above

14. A bottle full of water weighs 45 g, when full of mercury it weighs 360 g. If the empty bottle weighs 20 g, what will be the density of mercury?

   A. 10 g cm$^{-3}$

   B. 7.5 g cm$^{-3}$

   C. 13.6 g cm$^{-3}$

   D. 20 g cm$^{-3}$

15. The temperature of a certain mass of gas is increased from 27$^0$C to 327$^0$C. Approximately how many times will the pressure on the sides of the container increases?

   A. 0.5

   B. 2

   C. 12

   D. 24

16. The volume of an enclosed gas is 200 cm³. The conditions are changed so that both the pressure and temperature are doubled. The new volume is

    A. 100 cm³

    B. 80 cm³

    C. 200 cm³

    D. 400 cm³

17. …………………….. states that the product of the pressure and volume of a fixed mass of gas is constant provided the temperature is unchanged.

    A. Avogadro's law

    B. Boyle's law

    C. Charle's law

    D. Dalton's law

18. Determine the pressure of an object at a depth of 10 m in oil, if the relative density of oil is 0.750

    A. 98100 N/m²

    B. 0.735 N/m²

    C. 73800 N/m²

    D. 73500 N/m²

19. The pressure of the tyres of a motor car is 195 kPa at a temperature of $19^0$ C. What will be the tyre pressure if after a long journey the temperature has risen to $49^0$ C?

    A. 100 kPa

    B. 200 k Pa

    C. 250 k Pa

D. 215 kPa

20. The process whereby heat is transferred in a fluid is known as

   A. Conduction

   B. Sublimation

   C. Convection

   D. Radiation

   20 x 4 =(80)