

**MHD FLOW PAST AN IMPULSIVELY STARTED VERTICAL PLATE IN A
ROTATING FLUID**

LIM YEOU JIANN

UNIVERSITI TEKNOLOGI MALAYSIA

MHD FLOW PAST AN IMPULSIVELY STARTED VERTICAL PLATE IN A
ROTATING FLUID

LIM YEOU JIANN

A dissertation submitted in partial fulfillment of the
requirements for the award of the degree of
Master of Science (Mathematics)

Faculty of Science
University Teknologi Malaysia

JANUARY 2013

To my beloved father and mother

ACKNOWLEDGEMENT

First of all, a special thanks and a deep appreciation to my supervisor, Dr. Sharidan Shafie. He had taught me a great deal throughout the course of this study. Under his guidance enabled me to see things more clearly and think critically. He will consult and encourage me at any time I needed. Again thank a lot to Dr. Sharidan Shafie. Besides that, I sincerely have to thank to all those who have supported and helped me in writing this report especially Dr Ilyas Khan.

Apart from that, I also would like to extend my sincere appreciation to my entire friends, who had kindly provided valuable and helpful comments in the preparation of the thesis, and to those who have involve directly or indirectly in the preparation of this thesis, whom I have not mentioned above.

Last but not least, we would like to express our grateful to our family for their advice and moral support.

ABSTRACT

In this research we study the heat and mass transfer for the magnetohydrodynamic (MHD) free convection flow over an impulsively started infinite vertical flat plate in the presence of thermal radiation and thermal diffusion (Soret effect) in a rotating viscous fluid. The governing equations, which are the momentum equation, energy equation and mass equation, are derived by using the conservation law. The governing equations are transformed into non-dimensional forms by using the non-dimensional variables. The exact solutions of the non-dimensional governing equations are obtained with the help of Laplace transform technique. These solutions satisfy all imposed initial and boundary. The numerical results of velocity, temperature, concentration, skin friction, the rate of heat transfer and mass transfer are displayed and analysed through graphs and tables. The results show that with increasing rotation parameter E , the secondary velocity increases whereas primary velocity decreases. The primary velocity and secondary velocity are increased by increasing of Soret number, So but decreased by increasing radiation parameter, R .

ABSTRAK

Dalam kajian ini, pemindahan haba dan jisim bagi aliran olakan bebas hidrodinamik magnet (MHD) melintasi suatu plat rata menegak tak terhingga dimulakan secara dedenyut dikaji dengan kehadiran sinaran haba dan resapan terma di dalam bendalir likat berputar. Persamaan menakluk yang terdiri daripada persamaan momentum, persamaan tenaga dan persamaan jisim diterbitkan dengan menggunakan hukum pengabadian. Persamaan ini diubah ke bentuk tak bermatra menggunakan pembolehubah tak bermatra. Penyelesaian tepat bagi persamaan menakluk tak bermatra ini diperolehi dengan bantuan teknik penjelmaan Laplace. Penyelesaian ini memenuhi semua syarat awal dan syarat sempadan yang dikenakan. Penyelesaian berangka bagi halaju, suhu, kepekatan, geseran permukaan, kadar pemindahan haba dan pemindahan jisim dipaparkan dan dianalisis melalui graf dan jadual. Keputusan menunjukkan apabila parameter putaran, E meningkat halaju sekunder meningkat, manakala halaju utama menurun. Halaju utama dan halaju sekunder meningkat dengan peningkatan Nombor Soret, So tetapi menurun dengan peningkatan parameter radiasi, R .