ABSTRACT

The laws which govern the heat transmission are very important to engineers in the field of design, construction, testing and operation of heat exchange apparatus. The study of heat transfer is of great significance to engineers to create control and sustain any thermal scheme in order to transfer particular amount of heat in a known time.

Electrical engineers apply the knowledge of heat transfer for design of cooling systems for motors, generators and transformers. Chemical engineers are concerned with the evaporation, condensation, heating and cooling of fluids. Mechanical engineers deal with the problem of heat transfer in the field of internal combustion engines, steam generation and refrigeration.

The science of heat transfer seeks not merely to explain how heat energy may be transferred but also to predict the rate at which the exchange will take place under certain conditions.

The aim of the thesis is to study the exact solution of unsteady flow of viscous incompressible fluid past a parabolic started infinite vertical plate in the presence of thermal radiation with/without magneto hydrodynamic effect (MHD) and Hall effect under certain boundary condition.

Chapter 1 is a brief introduction and it explains the systematic development of the work done in the area of heat and mass transfer effects on parabolic started infinite vertical plate in the presence of thermal radiation.

In chapter 2, the problem on radiative flow past a parabolic started infinite isothermal vertical plate with uniform mass diffusion in the presence of thermal radiation with/without MHD effects are extensively discussed. The
fluid considered here is a gray, absorbing-emitting radiation but a non-scattering medium.

Laplace transform method is used to solve differential equations in dimensionless form. Various physical quantities like time, thermal and mass Grashof number, radiation parameter and Schmidt number are used to analyze the profiles of velocity, concentration and temperature. It is seen that concentration increases with decreasing values of Schmidt number. It is also seen that the plate temperature decreases due to high thermal radiation. This confirms that in the case of high thermal radiation there is more loss of heat. It is studied that in the case rising values of thermal radiation, the velocity of the fluid falls rapidly. But it seems that velocity rises for rising values of thermal Grashof or mass Grashof number.

Chapter 3 deals with the study of some problems on unsteady flow of viscous incompressible fluid past a parabolic started infinite isothermal vertical plate with /without MHD effect in the presence of thermal radiation with variable mass diffusion. The fluid considered here is a gray, absorbing-emitting radiation but a non-scattering medium.

Laplace transform method is applied for solving differential equations in non-dimensional form. Different thermo physical parameters are analyzed to plot the graphs for velocity, concentration and temperature as in chapter 2. The results are analyzed in detail and the same are presented graphically. By lowering Schmidt number values, it seems that the concentration of the fluid rapidly increases. It is seen that the plate temperature decreases due to high thermal radiation. It is studied that, for higher values of thermal or mass Grashof number, fluid velocity increases. But for thermal radiation, the fashion gets repealed. It is also observed that skin friction increases with increasing values of thermal radiation parameter,
but the trend changed in opposite direction in the case of magnetic field parameter.

In chapter 4, the exact solution of unsteady flow of viscous incompressible fluid past a parabolic started infinite vertical plate with variable temperature in the presence of thermal radiation with/without MHD effect and with uniform mass diffusion is discussed. The resulting equations are solved using Laplace transform method and the expression for velocity, temperature and concentration are obtained and discussed extensively with the help of graphs for various physical parameters.

Chapter 5 analyzes some problems on thermal radiation effects on unsteady flow past a parabolic accelerated infinite vertical plate with/without MHD effect under certain boundary conditions. The Laplace transform technique is used to obtain the expression for velocity, temperature and concentration field of the fluid. The influence of various physical parameters occurring in the problem on velocity, temperature and concentration are extensively discussed.

It is seen that the plate temperature decreases due to high thermal radiation. It is also studied that concentration increases with decreasing values of Schmidt number. It is noticed from the velocity profile that, if thermal or mass Grashof number increases, the curve shows an upward trend in the velocity. In the case of increasing values of radiation parameter, magnetic parameter and Schmidt number, there is a downward trend in the velocity profile. The friction between fluid layers increases slowly by increasing thermal radiation parameter. For higher values of Nusslet number and Sherwood number, the drag force decreases.
Chapter 6 presents a problem on unsteady fluid flow on an isothermal plate, which is accelerated in a parabolic manner with uniform mass diffusion. Thermal radiation is also considered with Hall and MHD effects. The Laplace transform technique is used to obtain the expression for velocity, temperature and concentration field of the fluid. The influence of various physical parameters occurring in the problem on velocity, temperature and concentration are extensively discussed.

It is seen that the axial and transverse velocity decreases when there is an increase in thermal Grashof or mass Grashof number. It is observed that axial velocity decreases and transverse velocity increases when there is an increase in thermal radiation parameter. It is also observed that skin friction due to primary velocity increases and skin friction due to secondary velocity decreases when there is an increase in thermal radiation parameter and there is an increase in thermal Grashof or mass Grashof number.