ABSTRACT

The study of heat transfer is of great importance to engineers and scientists to design, to operate and maintain of any thermal system in order to transfer specified amount of heat in a given time. 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 specified 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 with constant heat and mass flux in the presence of thermal radiation and chemical reaction parameter. The layout of the thesis consist of five chapters.

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 a parabolic started infinite vertical plate in the presence of thermal radiation parameter and chemical reaction.

In Chapter 2, the problem of radiative flow past a parabolic started isothermal vertical plate and uniform mass flux in the presence of thermal radiation parameter. The fluid considered here is a gray, absorbing-emitting radiation but a non-scattering medium. The dimensionless governing equations are solved using Laplace-transform technique. The effects of the velocity, the temperature and the concentration are studied for different physical parameters like thermal radiation parameter, thermal Grashof

number, mass Grashof number, Schmidt number and time. It is observed that the velocity increases with decreasing values of the thermal radiation parameter. This shows that the heat loss is more due to higher thermal radiation. The trend is just reversed with respect to the thermal Grashof number or mass Grashof number.

Chapter 3 deals the problem of unsteady flow of viscous incompressible fluid past a parabolic started infinite vertical plate with variable temperature and uniform mass flux, in the presence of thermal radiation. The plate temperature is raised linearly with time and the mass diffused from the plate to the fluid at a constant rate. The fluid considered here is a gray, absorbing-emitting radiation but a non-scattering medium. The resulting coupled partial differential equations are solved using Laplace-transform technique. The effects of the velocity, temperature and concentration for different physical parameters as discussed in Chapter 2. The results are analyzed in detail and the same are presented graphically. It is observed that the velocity increases with decreasing values of the thermal radiation parameter. The trend is just reversed with respect to the thermal Grashof number or mass Grashof number. The plate temperature decreases due to high thermal radiation. It is also seen that the concentration increases with decreasing Schmidt number.

In Chapter 4, the exact solution of unsteady flow of viscous incompressible fluid past a parabolic started infinite vertical plate with constant heat flux and mass diffusion in the presence of homogeneous chemical reaction of first-order. The plate temperature is raised at a constant rate and the mass is diffused from the plate to the fluid uniformly. Laplace

transform method is employed to solve the resulting coupled partial differential equations. Expressions for velocity, temperature and concentration are obtained and their variations with axial distance, chemical reaction parameter, thermal Grashof number, mass Grashof number, Schmidt number, Prandtl number and time are sketched graphically and are discussed in detail. It is observed that the velocity increases with decreasing chemical reaction parameter, but velocity increases with increasing thermal Grashof number or mass Grashof number.

Chapter 5 analyzes the theoretical study of unsteady flow of viscous incompressible fluid past a parabolic started infinite vertical plate with uniform heat flux and variable mass diffusion in the presence of homogeneous chemical reaction of first-order. The plate temperature is raised uniformly at a constant rate and the concentration level near the plate is raised linearly with respect to time. The Laplace transform method is used to solve the resulting coupled partial differential equations. The expressions for velocity, temperature and concentration are obtained. The effects of the velocity, temperature and concentration for different physical parameters are studied and shown graphically and the results are discussed in detail. It is noticed that the velocity increases with decreasing chemical reaction parameter. But, the trend is just reversed with respect to the thermal Grashof number or mass Grashof number.