The mathematical modelling of a stenosed arterial flow is now attracting the medical scientists, bio mathematicians, bio technocrats due to precise study of different parameters related to it. Also, mathematical model producing the web propagation characteristics of a stenosed artery are of interest for clinicians.

The aim of this study is to investigate the flow mechanics of blood flow through stenosed artery of human body. Blood and blood vessels have mechanical properties and due to their unusual properties the study becomes very complicated. That is why medical scientists do not have precise information of various parameters related to the flow of blood. Mathematical analysis and computational studies of these movements would be highly complex without use of simplifying models. Owing to the complexity of the analytical solutions of these flow problems, it is proposed to investigate and analyze some specific physiological flow problems such as blood flow in capillary tissue fluid exchange, blood flow through artery in catheterized curve artery etc., by using numerical techniques which may be realistic for the use of medical doctors and other bio scientists.

In this thesis, some physiological problems of blood flow with cosine shaped and multiple mild stenosis in an artery have been studied. Numerical results are obtained by using “MATLAB”. Results obtained are interpreted and represented graphically. The whole work of the thesis is divided into seven chapters. To avoid the repetitions, the references of the literature cited are given alphabetically at the end of the thesis.

The chapter-wise organization of the thesis is as follows:
CHAPTER-1

GENERAL INTRODUCTION

The chapter-1 describes the general introduction and gives a brief account for blood vessels, arterial system, arterial diseases, cardiovascular system, characteristics of blood, magneto-hydrodynamics, porous medium and periodic body acceleration etc. At the end of the chapter, summary of the whole work embodied in the thesis is given.

CHAPTER-2

EFFECT OF RADIAL VISCOSITY VARIATION ON NON-NEWTONIAN FLOW OF BLOOD IN A STENOSED ARTERY

This chapter is divided into two sections. In section-A, the flowing blood is considered as the Power-law fluid model and in section-B, it is considered as the Bingham-plastic fluid model. The mathematical model for the blood flow in a cosine shaped stenosed artery under the viscosity variation of the blood is developed. The non-Newtonian flow of blood in a stenosed artery is numerically studied under the linear and quadratic variation of viscosity of the blood and is discussed graphically. The results show that the resistance to flow and wall shear stress decrease due to radial decrease in blood viscosity around the stenotic region.

CHAPTER-3

EFFECTS OF MULTIPLE STENOSIS WITH RADIAL VISCOSITY VARIATION IN AN ARTERY

In the present investigation, the effects of multiple stenosis on blood flow characteristics
in a narrow artery have been investigated by assuming that there exists a radial decrease in blood viscosity from axis to the wall. The mathematical model for present study is formulated by improved generalized geometry of multiple stenosis located at equi spaced points in an artery. In section-A, the blood is modelled as Power-law fluid in a uniform circular tube with axisymmetric stenosis and in section-B, it is modelled as Bingham-plastic fluid. The expressions for resistance to flow and wall shear stress have been obtained and discussed graphically.

**CHAPTER-4**

**A STUDY OF AXIAL VISCOSITY VARIATION ON NON-NEWTONIAN FLOW OF BLOOD IN AN ARTERY WITH MILD STENOSIS**

In the present chapter, a model to study the effects of axial variation of viscosity caused by accumulation of red cells in the stenotic region of an artery with mild stenosis on resistance to flow and wall shear stress is modelled and analyzed. This biorheological aspect is taken into account in the Power-law fluid model in section-A and the Bingham-plastic fluid model in section-B by assuming that the viscosity of blood increases axially in the stenotic region upto the point of maximum height of stenosis after which it decreases. The analysis shows that as viscosity increases the resistance to flow and the wall shear stress both increase.
CHAPTER-5

EFFECT OF MULTIPLE MILD STENOSIS ON NON-NEWTONIAN FLOW OF BLOOD IN AN ARTERY WITH AXIAL VISCOSITY VARIATION

The aim of this chapter is to study the effects multiple mild stenosis on the flow of blood through an artery with axial viscosity variation. The mathematical model for present study is formulated by improved generalized geometry of multiple stenosis located at equi-spaced points in an artery. In section-A, the flowing blood is assumed as Power-law fluid and in section-B, it is assumed as Bingham-plastic fluid. Expressions for resistance to flow and the wall shear stress are obtained and represented graphically.

CHAPTER-6

EFFECT OF RADIAL MAGNETIC FIELD ON FLOW OF BLOOD IN A CATHETERIZED TAPERED ARTERY WITH MILD STENOSIS

This chapter deals with a steady, laminar flow of blood through an annulus, enclosed between an arterial stenosis, developed along a tapering wall and a uniform catheter, co-axial to it under the influence of radial magnetic field. In this investigation, body fluid blood is assumed to behave like Newtonian fluid. A velocity slip condition is employed at the catheterized wall with different sizes of stenosis and no-slip at the catheter boundary is taken. The analytical expressions are obtained for axial velocity, flow rate, wall shear stress and apparent viscosity. The radial magnetic field reduces the wall shear stress and hence the damaging of diseased vessel wall can be lowered. Therefore as recourse, radial magnetic field at vessel wall can be exploited in lessoning the damage to the inner artery wall as well as improving the normal functioning of an occluded artery.
CHAPTER-7

STUDY OF BLOOD FLOW THROUGH POROUS MEDIUM UNDER BODY ACCELERATION IN A STENOSED TAPERED ARTERY

In this last chapter, a mathematical model is developed for the blood flow in tapered stenosed artery through a porous medium under the influence of time dependent body acceleration. In this model, the blood behaves as a Newtonian fluid. The effect of porosity parameter and body acceleration on axial velocity, shear stress and flow rate has been analyzed numerically. Results show that all the flow characteristics are strongly affected by the influence of porous media and periodic body acceleration.