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ABSTRACT OF MY THESIS ENTITLED 'MATHEMATICAL MODELING OF FERROFLUID LUBRICATED BEARING DESIGN PROBLEMS' IS AS UNDER.

Chapter 1 mainly deals with the motivation as well as literature survey of the present work.

Chapter 2 contains physico-mathematical background necessary to understand the subsequent chapters. That means it contains pre-requisite for the problems discussed in the subsequent chapters.

Chapters 3-6 are author's own contributions, which mainly deals with the use of Shliomis model for Ferrofluid(FF) flow using transverse or oblique radially variable magnetic fields (VMFs). The Shliomis model is important because it includes the effects of rotations of the carrier liquid as well as magnetic particles. Also, the variable magnetic field is important because of its advantage of generating maximum field at the required active contact zone in the bearing design systems. Using Shliomis model different bearing designs are discussed from different viewpoints, where in some designs effect of porosity is also considered. The effect of porosity is included because of its advantageous property of self-lubrication. Moreover, the validity of the Darcy's law is assumed in the porous region. In all problems equation of continuity is also considered while deriving the mathematical model in both film as well as porous region.

Chapter 3 derived modified Reynolds equation for the study of lubrication of different slider bearings by considering the effects of oblique radially variable magnetic field and

squeeze velocity. Using Reynolds equation, expressions for dimensionless load-carrying capacity, frictional force, coefficient of friction and center of pressure are obtained. Using these expressions, results for different slider bearings are computed for different parameters and compared.

In Chapter 4 modified Reynolds equation for lubrication of circular squeeze film-bearings is derived by considering the effects of oblique radially variable magnetic field, slip velocity at the film-porous interface and rotations of both the discs. The squeeze film-bearings are made up of circular porous upper disc of different shapes (exponential, secant, mirror image of secant and parallel) and circular impermeable flat lower disc. Using Reynolds equation, general form of pressure equation is derived and expression for dimensionless load-carrying capacity is obtained. Using this expression, results for different bearing design systems (due to different shapes of the upper disc) are computed and compared for variation of different parameters.

In Chapter 5 the case of porous journal bearing is studied. The modified Reynolds-Darcy equation for porous journal bearing is derived by considering the effects of squeeze velocity, anisotropic permeability and slip velocity. Using Reynolds equation dimensionless form of load-carrying capacity is obtained and studied for different parameters.

In Chapter 6 static and dynamic performance of FF lubricated long journal bearing is studied. Here, FF is controlled by transverse uniform magnetic field. The modified Reynolds equation is derived. The dimensionless expressions for load-carrying capacity, frictional force and coefficient of friction are studied for static case, while the dimensionless expressions for stiffness coefficients and damping coefficients are studied for dynamic case.