# Abstract

The present thesis entitled **"A Study of Some Cosmological Models in Scalar-Tensor Theory of Gravitation"** comprises seven chapters. First chapter consists of introduction and review of related literature of the thesis. Subsequently chapter-2 to chapter-6 are based on our research work. The last chapter contains conclusion and future scope of the research work. The derived relations have been used to draw graphs and interpret results in each chapter to test the observational validity of the physical behaviour of the models of the universe.

The **chapter-1** comprises basic definitions related to standard cosmology, Friedmann-Lemaitre-Robertson-Walker Metric, Bianchi Cosmologies and Energy-momentum tensor. We presented scalar-tensor theory, S*á*ez-Ballester Theory, homogeneous and anisotropic universe, cosmological parameters and kinematical parameters in this chapter. It also includes a literature review relevant to the work described in the thesis.

In **chapter-2,** we investigated the interaction of a five dimensional Bianchi type-I anisotropic cloud string cosmological model universe with an electromagnetic field using S*á*ez-Ballester theory. Here we assume the sum of the rest energy density and string tension density is the energy momentum tensor in an electromagnetic field. To solve the field equations, we employed the average scale factor as an integrating function of time. The model's numerous physical properties are also investigated.

In **chapter-3** within the framework of S*á*ez-Ballester theory in five dimensional space-time we presented FRW cosmological model in presence of a perfect fluid. To establish a definitive solution to the field equations, we used a power law between the scalar field and the universe's scale factor. There are models that radiate a flat, closed

and open universe. The model's physical characteristics are also discussed.

In **chapter-4**, we studied within the context of a scalar-tensor theory provided by S$\acute{a}$ez-Ballester, a spatially homogeneous and anisotropic five dimensional Bianchi type-I space-time filled with perfect fluid. Using a specific Hubble's parameter law of variation that produces a constant value of deceleration parameter, two distinct physically valid versions of the universe are constructed. The Einstein field equations are calculated precisely, and the answers are found to be consistent with type Ia supernova observations. The models' physical and kinematic qualities are thoroughly investigated.

**Chapter-5** deals with anisotropic LRS Bianchi type-V cosmological models with bulk viscous string within the framework of S$\acute{a}$ez-Ballester theory in five dimensional space-time. To obtain a determinate solution we consider the plausible physical conditions (i) the scalar expansion is proportional to shear scalar (ii) the baratropic equation of state for pressure and density (iii) the bulk viscous pressure is related to the energy density. The model's physical and kinematic features are also discussed.

In **chapter-6**, we have examined a five dimensional FRW cosmic space-time in a source of bulk viscous fluid using the S$\acute{a}$ez-Ballester scalar-tensor theory of gravitation. We employed a power law between a scalar field and the universe's scale factor to examine determinate solutions to the field equations. We consider the radiating flat, closed and open forms. In each case, the physical and kinematic properties of the models were investigated. In this chapter, we show that our model extends and is free from initial singularities.

In **chapter-7**, we summarized the results obtained in each chapter and presented the future scopes related to our research work in this thesis.