Chapter 8

Summary of the Concluding

The thesis entitled **A Study on Bianchi Type-V Cosmological Models in Lyra's Geometry** comprises nine chapters devoted to the study of spatially homogeneous and anisotropic Bianchi type-V models in Lyra's geometry and alternative theories of gravitation along with modified $f(R,T)$ theory of gravity. There are several sections in each chapter. Each chapter begins with an introduction and a summary of recent work in GR. However, the concluding portion is devoted to references as sources of information to verify our study's findings. The mathematical formulation of the general theory of relativity, based on Riemannian geometry, is also described. This chapter solely discusses the fundamental concepts to comprehend cosmology and cosmological models. Finally, in the end, the current work's rationale and scope of future effort are discussed.

Chapter 2 is entitled **Bianchi Type-V Modified $f(R,T)$ Gravity Model in Lyra Geometry with Varying Deceleration Parameter**. The solutions of the field equations are found in Lyra's geometry with a time-dependent displacement vector. It is also observed that the time variations of the DP is positive to negative (i.e., early deceleration to late time acceleration). Interestingly, the Λ CDM model does not present in this anisotropic $f(\widetilde{R},T)$ universe model. However, a DE model with expansion fits the latest observation data. In this chapter, the physical and kinematic features of the models are also studied thoroughly.

Chapter 3 is entitled **Bianchi type –V Dark Energy Modified $f(R,T)$ Gravity Model in the Presence of Massive Scalar Field in Lyra Geometry**. This chapter looked at spatially homogenous and fully anisotropic Bianchi type-V cosmological models based on Lyra's geometry in the presence of a massive scalar field in the $f(R,T)$ gravity theory. The model is non-singular and undergoes exponential growth from a limited volume, resulting in early inflation. The model is homogenous and uniform throughout since the anisotropy value is constant. However, the model is isotropic and shear free at late times, according to the present cosmological scenario. The model's density diminishes as time passes, eventually reaching a minimum positive value. However, the pressure stays negative throughout the evolution of time, satisfying the current observational facts that DE exists in this $f(\widetilde{R},T)$ gravity model. Λ CDM is not found in this chapter either.

Chapter 4 is entitled **Bianchi Type-V Cosmological Model with Heat conduction in Lyra Geometr**. This model is free of initial singularity, with all metric potentials A,B,C, and the volume remaining constant for t approaches 0, using an ad-hoc connection among the metric potentials. The model's energy density and pressure converge to infinity as t approach 0, showing that the universe developed from a singularity point. In this scenario, the universe expands rapidly at first and then progressively contracts for a significant value of t, and the expanding universe likewise exhibits anisotropy at this cosmic period t. The state finder parameters r and s tend to 0 and 1, suggesting that our model approaches Λ CDM.

Chapter 5 is entitled **Bianchi Type-V Dark Energy model in Lyra Geometry in the Magnetic field**. In the framework of Lyra's manifold, Bianchi type-V cosmological models is obtained in the presence and absence of a magnetic field. The displacement vector β was high at the beginning of the universe, both in the presence and absence of a magnetic field, and it rapidly decreased as the universe evolved. The measured value of β is similar to the magnitude of the cosmological constant, as confirmed by Halford and recent observations of SNe Ia. Energy density, pressure, displacement vector, expansion scalar, and shear scalar are all affected by the presence of a magnetic field. Also, $\lim_{x\to\infty}\frac{\sigma^2}{\theta^2}\neq 0$, therefore the models do not approach isotropy for large value of t. The models depict an expanding, shearing, non-rotating universe in which the flow vector is geodetic in both situations of magnetic fields. DE is found in both situations, the most mysterious scenario in the current cosmological model. Furthermore, the model does not evolve the Λ CDM model with the present observational data.

Chapter 6 is entitled **Bulk Viscous Bianchi Type-V Cosmological Model with Special Type of Scale Factor in Lyra Geometr**. The model represents an expanding, shearing, and non-rotating universe that began with a big bang. It is also found that the displacement vector was enormous at the beginning of the universe and rapidly decreased as it evolved, matching the behavior of the cosmological constant. We have also compared all our models' energy conditions with SNeIa data. All of the models were found to agree with the observational findings.

Chapter 7 is entitled **Bianchi Type-V Dark Energy Model with varying EOS parameters in Lyra Geometry**. In this chapter, a quadratic equation of state is used to investigate the four-dimensional Bianchi type V cosmological model in Lyra's geometry in the presence of perfect fluid, an inflationary model. Several researchers examine the basic features of the Bianchi Type-V cosmological model with a time-dependent displacement vector, demonstrating that the notion of Lyra geometry may survive indefinitely with various ideas and conceptions. All the different energy conditions are depicted with a graph, and obtain that SEC and DEC are both violets for the whole evolution of the current universe in the setting of the EOS parameter in Lyra geometry.