ABSTRACT OF THE THESIS ENTITLED WITH "NON - EQUILIBRIUM THERMODYNAMICS IN COSMOLOGICAL CONTEXT".

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This thesis is based on six chapters including an introductory chapter at the beginning and a discussive chapter on the future scope of these works at the end.

(1) In the first chapter, A brief introduction to thermodynamics and its applications in cosmology has been described. In several sections, the basics of thermodynamics and the classical laws of thermodynamics have been discussed, the necessity of non-equilibrium thermodynamics for Universe has been described and the elements of cosmology have been mentioned briefly.

(2) Chapter:2 deals with the thermodynamic stability criteria of the cosmic fluids under diffusion mechanism. The Universe is modeled as a system of diffusive barotropic fluids of both constant and variable barotropic indices. In both cases, the restrictions on diffusion parameter from thermodynamic stability of the cosmic fluids for different ranges of barotropic indices (ω).

(3) In chapter : 3, It is investigated whether the emergent scenario of the universe is possible under diffusion mechanism. For suitable choices of parameters contained in the evolution equation, the possibility of emergent

scenario has been established.

(4) Chapter: 4 is the successful exhibition of the continuous and complete cosmic scenario under non-equilibrium thermodynamic phenomena. In order to incorporate the dissipative pressure in a single fluid isolated Universe, an extra term containing scalar field has been introduced in Einstein's field equations in analogy with the cosmological constant. Hence, the Friedmann equations have been obtained from the modified field equations. Then for suitable phenomenological choices of time dependent scalar field, different phases of complete cosmic evolution have been established. The thermodynamic behaviour of the cosmic fluid has also been studied while cosmic phase transition and it is found as first order thermodynamic phase transition.

(5) In chapter: 5, the Universe is modeled as a cosmic heat engine by phenomenological choice of scalar field and proper restrictions on different parameters. This cosmic heat engine corresponds to the cyclic, bouncing and non-singular evolutionary scenario.

(6) Finally, the thesis ends with a " BRIEF SUMMARY AND FUTURE PROSPECT " of the work in Chapter: 6.

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