Chapter 1
1.1. INTRODUCTION

Thermo-acoustic parameters of pure metals and alloys of aluminium-copper, copper-zinc, and aluminium-zinc have been studied in this work. Thermal coefficient of linear expansion $\alpha_L$, is measured using the thermal expansion apparatus described elsewhere where for copper-aluminium and assumed from literature [2] for other alloys. The value of expansivity $\alpha_L$ is evaluated through the relation

$$\alpha_L = 3\alpha'$$

... (1.1).

The alloys have been prepared in the laboratory. The method of preparation is described elsewhere [1]. Longitudinal ultrasonic velocities in the thirteen samples (metals and alloys) are measured at 30°C and 70°C through pulse technique. Using the temperature coefficient of velocity, the velocities at higher temperatures are evaluated. The shear velocities [2-5] and heat capacities [6-10] are adopted from literature. Densities at higher temperatures are evaluated through the experimental volume expansivities of literature [11-20]. Using the thermal coefficient of velocity, velocities at higher temperatures are evaluated. Using the velocity and density data, the adiabatic compressibility is determined. Using heat capacity [6-10] and volume expansivity, isothermal compressibility is estimated. The ratio of heat capacities $\gamma$ is evaluated. The details of experimental Technique is presented in Sections 2-8 of next Chapter. The bulk modulus $\beta_s$, shear modulus $G$, Young's modulus $E$, and Poisson's ratio $\nu$, have been evaluated [21-25] as described in Section 7 of Chapter 2. The discussion on variation of these parameters as a function of temperature for the metals and alloys is presented in Sections 1-5 of Chapter 4. Grüneisen parameter is an important constant related to internal pressure. Other thermoacoustic parameters have been evaluated in light of this parameter [31-37]. The temperature dependence of the allied parameters is discussed in Section 2 of Chapter 3. The detailed study of thermo-acoustic properties as a function of temperature and composition is helpful to delinate the structural details of the alloys [38-43]. The allied aspects are discussed in Chapter 5.