CHAPTER 3

Main Objectives and Importance of the Research Work

3.1 Main objectives of the research work

The removal of excessive heat from system components is essential to avoid the damaging effect of burning or overheating. Therefore, the enhancement of heat transfer is an important subject of thermal engineering. The heat transfer from surface may in general be enhanced by increasing the heat transfer coefficient between a surface and its surrounding, by increasing heat transfer area of the surface or by both. Extended surface that are well known as a fins are commonly used to enhance heat transfer in many industries. Therefore, various types of fins but rectangular plate fins and square pin fins are commonly used for both by natural and forced convection heat transfer. Many investigators have studied the heat transfer phenomena of rectangular fin arrays by natural convection numerically as well as experimentally. Abdullah H. AlEssa et.al. [1-3] have got enhancement of natural convection heat transfer from a fin by triangular perforations, square perforation and rectangular perforation by using finite technique. Earlier studies by H. S. Dhanawade and K. H. Dhanawade [12,13,16] studies on experimental investigation on perforated fin arrays on heat transfer concludes that adding perforation to the fins enhances heat dissipation rates and at the same time reduction of fins weight. Low weight means saving material of fin and related equipment such as heat sinks. Conclusion by Gawali B. S. et al. [8] is that adding the cross fin to the fin array improves the heat transfer characteristics. Hence present research is on adding the perforations to the fins as well as adding the cross fin at center of fin array may multiply the enhancement of heat transfer.

3.2 Importance of the proposed research work

Fin arrays on horizontal and vertical surfaces are used in a variety of engineering applications to dissipate heat to surrounding. For examples Electrical transformers, motors, air cooled cylinders of air craft engines , air-cooled I. C. engines, air compressors, Economizers for steam power plants, convectors for steam and hot water heating of system, cooling coils and condenser coils in refrigerators and air conditioners electronic equipment and heat exchangers. The main controlling variables generally available to the designer are the orientation and the geometry of the fin arrays.
Heat transfer plays vital role in increasing the efficiency, and reducing the cost, hence in the current high tech competitive world, it is requirement of enhancement of the heat transfer.

Nowadays requirement of heat transfer technology is lightweight material and improvement of heat transfer coefficient. Extended surface, commonly known as fins, often offer an economical and trouble free solution in many situation demanding natural convection cooling.

Available studies on perforated fins revels that the perforation to the fins enhances heat dissipation rates at the same time reduction of fins weight. Low weight means saving of material and cost of fins and related equipments such as heat sinks.

In addition, Available studies on rectangular fin arrays cross fin at centre revels that applying the cross fin at centre to the rectangular fin arrays improves the thermal performance.

Hence, use of perforated rectangular fin arrays with perforated cross fin at centre may multiply the thermal performance, which is our postulate.

That why it is decided to analyze experimentally the thermal performance of Rectangular Perforated Fins with Cross Fins at Centre by Natural Convection. On its success may be a revolution in area of heat dissipation, will have big impact to mass.

Also from available literature, survey of the selected topic [9,10] “Thermal Performance Analysis by Natural Convection of Perforated Rectangular Fins with Cross Fins at Centre” shows, this topic has remained untouched by researchers.