(b) Explain design, modeling and simulation.

(c) Explain the difference between finite volume method and finite element method.

(d) State various optimization techniques.

(e) Explain briefly the search method of optimization.

(f) Discuss various performance parameters used for design of heat exchanger.

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2936 Roll No.

B.Tech.

(SEM. VIII) THEORY EXAMINATION 2011-12

DESIGN OF THERMAL SYSTEMS

Time : 3 Hours *Total Marks : 100*

Note :—Attemp **all** questions.

1. Attempt any **four** parts of the following :— **(4×5=20)**

(a) State the factors which should be taken into consideration while selecting a system of air-conditioning.

(b) Explain the procedure to draw a GSHF line on a psychrometric chart.

(c) Write down the procedure for calculating heat gains through building structures.

(d) What do you mean by infiltration ? Explain briefly how air leakage through window and door cracks can be estimated.

(e) Enumerate and explain the components of internal heat gain.

(f) Discuss the effect of various design parameters on cooling tower performance.

2. Attempt any **four** parts of the following :— **(4×5=20)**

(a) Explain the factors which affect the total volumetric efficiency of compressor.

(b) Discuss the selection of refrigeration and air conditioning controls for the system.

(c) Discuss briefly the various methods used for capacity control of reciprocating compressor.

(d) What is heat rejection factor for a condenser ? On which factor does it depend ?

(e) Explain briefly the factors which affect the heat transfer capacity of an evaporator.

(f) Why refrigerators are so selected that evaporator pressure and condenser pressure are greater than atmospheric pressure ?

3. Attempt any **two** parts of the following :— **(2×10=20)**

(a) A centrifugal compressor has a pressure rise of 4/1 with a isentropic efficiency of 80% when running at 1500 rpm and inducing air at 20°C. Guide vanes at inlet give the air a prewhirl of 25° to the axial direction at all redii and mean diameter of the eye is 250 mm; the absolute air velocity at inlet is 150 m/s. At exit the blades are radially inclined and the impeller tip diameter is 590 mm. Calculate the slip factor of the compressor.

(b) Discuss the various factors affecting stage pressure ratio of axial flow compressor. Show the various design parameters of blade with sketch.

(c) Discuss the various steps for design of axial flow turbine stage.

4. Attempt any **two** parts of the following :— **(2×10=10)**

(a) Discuss the various heat exchanger design methods indicating merits and demerits.

(b) Derive an expression for the overall heat transfer co-efficient of a shell and tube exchanger taking into consideration scale formation on the inside surface and film coefficients on the inside and outside surface of the tube. Under what conditions the overall coefficient reduces to hi ho/(hi + ho), where hi and ho are inside and outside film coefficients.

(c) A counter flow heat exchanger is used to cool 0.8 kg/s of air from 45°C to 15°C. The cooling water of 0.75 kg/s enters the system at 8°C. If the overall heat transfer coefficient is 35 W/m^2K, what heat exchanger area is required ? If the same air-flow rate is maintained while the water flow rate is reduced to half, how much will be the reduction in heat transfer ?

5. Attempt any **four** parts of the following :— **(4×5=20)**

(a) State physiological principles for comfort air-conditioning.