Sample paper - II

Time: Three hours, Maximum: 100 marks

Attempt Three Question from Each Section

Each Question Carries Equal marks

Section A:-

Q.1. What is convection and how is it different than conduction?

Q.2. What is the concept of controlling resistance?

Q.3. Explain why there is more heat transfer in forced convection as compared to natural convection.

Q.4. What are the criteria to know natural and forced convection?

Section B:-

Q.1. A hot oven is maintained at 180 oC having vertical door 50 cm high is exposed to the atmospheric air at 20oC. Calculate the average heat transfer coefficient at the surface of the door.

The various air properties at the average temperature [(180+20)/2 = 100oC] are,

k = 0.032 W/m oC;   Pr = 0.7;   Kinematic viscosity = 24 x 10-6 m2/s

At Tb = 20oC, $\beta = \dfrac{1}{293\ K}$

Q.2. In the oven door described in illustration 5.1 is subjected to an upward flow of air (that is forced convection). What would be the minimum free stream velocity for which natural convection may be neglected?

Q.3. Saturated steam at 70.14 kPa is condensing on a vertical tube 0.5 m long having an outer diameter of 2.5 cm and a surface temperature of 80oC. Calculate the average heat-transfer coefficient.

Q.4. A pipe having 10 cm of diameter is carrying saturated steam at 8 bar of absolute pressure. The pipe runs through a room. The wall of the room is at 300 oK. A portion around 1 m of the pipe insulation is damaged and exposed to the room atmosphere. Calculate the net rate of heat loss from the pipe by radiation.