**SIR ISSAC NEWTON COLLEGE OF ENGINEERNG AND TECHNOLOGY**

**PAPPAKOIL, NAGAPATTINAM**

**DEPARTMENT OF MECHANICAL**

**CIA-II EXAM**

**SUB CODE/NAME:** ME8693 HEAT AND MASS TRANSFER **DATE : 28-05-22 SEM/YEAR: III / V TIME DURATION** : 1.30 Hrs

**PART A (5×2=10)**

1. Define effectiveness of the fin.

2. What is conduction?

3. What is meant by free or natural convection?

4. What are the dimensionless parameters used in forced convection?

5. What is meant by laminar flow and turbulent flow?

**PART B (4×10=40)**

6. Air at 400 K and 1 atm pressure flows at a speed of 1.5 m/s over a flat plate of 2 m long. The plate is maintained at a uniform temperature of 300 K. If the plate has a width of 0.5 m, estimate the heat transfer coefficient and the rate of heat transfer from the air stream to the plate. Also estimate the drag force acting on the plate.

7. Air at 25°C flows over 1 m x 3 m (3 m long) horizontal plate maintained at 200°C at 10 m/s. Calculate the average heat transfer coefficients for both laminar and turbulent regions. Take Re (critical) = 3.5 x 105

8. An aluminium rod (k =204 W/mK) 2 cm in diameter and 20 cm long protrudes from a wall which is maintained at 300°C. The end of the rod is insulated and the surface of the rod is exposed to air at 30°C. The heat transfer coefficient between the rod's surface and air is 10 W/m2K. Calculate the heat lost by the rod and the temperature of the rod at a distance of 10 cm from the wall.

9. A pipe consists of 100 mm internal diameter and 8 mm thickness carries steam at 170°C. The convective heat transfer coefficient on the inner surface of pipe is 75 W/m2C. The pipe is insulated by two layers of insulation. The first layer of insulation is 46 mm in thickness having thermal conductivity of 0.14 W/m°C. The second layer of insulation is also 46 mm in thickness having thermal conductivity of 0.46 W/ m°C. Ambient air temperature = 33°C. The convective heat transfer coefficient from the outer surface of pipe = 12 W/m2C. Thermal conductivity of steam pipe = 46 W/m°C. Calculate the heat loss per unit length of pipe and determine the interface temperatures.

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