**SIR ISSAC NEWTON COLLEGE OF ENGINEERING&TECHNOLOGY**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**SUBJECT CODE/NAME: ME6502 HEAT AND MASS TRANSFER**

**YEAR/SEM: III/V DATE:10.08.2017**

**PART A (5\*2=10)**

**1.** what is meant by natural convection?

**2.** what is forced convection?

**3.** sketch the temperature variations in parallel flow and counter flow heat exchanger?

**4,** what is meant by fouling factor?

**5,** state Stefan-boltzmann law?

**PART – B (4\*10=40)**

**1(a).** A hot plate 20 cm in height and 60 cm wide is exposed to the ambient air at 30°c. Assuming the temperature of the plate is maintained at 110°c. Find the heat loss from both surface of the plate. Assume horizontal plate.

(or)

**1(b).** In a surface condenser, water flows through staggered tube while the air is passed in cross flow over the tubes. The temperature and velocity of air are 30°c and 8m/s respectively. The longitudinal and transverse pitches are 22mm and 20mm respectively. The tube outside diameter is 18mm and tube surface temperature is 90°c. Calculated the heat transfer coefficient.

**2(a).** Air at atmospheric pressure and 200°c flows over a plate with a velocity of 5m/s. the plate is 15mm wide and is maintained t a temperature of 120°c. calculated the thickness of hydrodynamic and thermal boundary layer and the local heat transfer coefficient at a distance of 0.5m from the leading edge. Assume that the flow is on one side of the plate.

(or)

**2(b).** Air at 15°c , 30km/hr flows over a cylinder of 400mm diameter and 1500mm height with surface temperature of 45°c. calculate the heat loss.

**3(a).**In a double pipe heat exchanger, hot fluid with a specific heat of 2300 j/kg k enters at 380°c. cold fluid enters at 25°c and leaves at 210°c. calculated the heat exchanger area required for counter flow and what would be the percentage of increase in area if fluid flows were parallel.

Take overall heat transfer coefficient is 750w/m2k and mass flow rate of hot fluid is 1 kg/s

(or)

**3(b).**A parallel flow heat exchanger is used to cool 4.2 kg/min of hot liquid of specific heat 3.5 kj/kgk is used for cooling purpose at a temperature of 15°c. the mass flow rate of cooling water is 17kg/min. calculate the following.

(i).outlet temperature of liquid

(ii).outlet temperature of water

(iii). effectiveness of heat exchange.

**4.** The sun emits maximum radiation at ʎ= 0.5 µ. Assuming the sun to be a black body, calculated the surface temperature of the sun. Also calculated the monochromatic emissive power of the sun’s surface