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

**PAPPAKOIL, NAGAPATTINAM**

**DEPARTMENT OF MECHANICAL**

**CIA-I EXAM**

**SUB CODE/NAME:** ME8693 HEAT AND MASS TRANSFER **DATE: 05-02-20 YEAR /SEM: III / VI TIME DURATION**: 1.30 Hrs

**PART A (5×2=10)**

1. State Newton’s law of cooling or convection law.

2. State Fourier’s Law of conduction.

3. Define fins (or) extended surfaces.

4. Define convection.

5. Define boundary layer thickness.

**PART B (4×10=40)**

6. A wall is constructed of several layers. The first layer consists of masonry brick 20 cm. thick of thermal conductivity 0.66 W/mK, the second layer consists of 3 cm thick mortar of thermal conductivity 0.6 W/mK, the third layer consists of 8 cm thick lime stone of thermal conductivity 0.58 W/mK and the outer layer consists of 1.2 cm thick plaster of thermal conductivity 0.6 W/mK. The heat transfer coefficient on the interior and exterior of the wall are 5.6 W/m2K and 11 W/m2K respectively. Interior room temperature is 22C and outside air temperature is -5C. Calculate

i)Overall heat transfer coefficient

ii)Overall thermal resistance

iii)The rate of heat transfer

iv)The temperature at the junction between the mortar and the limestone.

7. An aluminium alloy fin of 7 mm thick and 50 mm long protrudes from a wall, which is maintained at 120C. The ambient air temperature is 22C. The heat transfer coefficient and conductivity of the fin material are 140 W/m2K and 55 W/mK respectively. Determine

i) Temperature at the end of the fin

ii) Temperature at the middle of the fin.

iii) Total heat dissipated by the fin.

8. Air at 20C, at a pressure of 1 bar is flowing over a flat plate at a velocity of 3 m/s. if the plate maintained at 60C, calculate the heat transfer per unit width of the plate. Assuming the length of the plate along the flow of air is 2m.

9. 250 Kg/hr of air are cooled from 100C to 30C by flowing through a 3.5 cm inner diameter pipe coil bent in to a helix of 0.6 m diameter. Calculate the value of air side heat transfer coefficient if the properties of air at 65C are

K = 0.0298 W/mK

= 0.003 Kg/hr – m

Pr = 0.7

= 1.044 Kg/m3

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