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**Reg. No.:**

 **SEMBODAI RUKMANI VARATHARAJAN ENGINEERING COLLEGE**

**ACADEMIC YEAR 2023-2024/ EVEN SEMESTER**

**CYCLE TEST – I (APRIL - 2024)**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**SUB. CODE/TITLE: ME3691 HEAT AND MASS TRANSFER**

**YEAR/SEM : III/ VI DATE : 01/04/2024**

**DURATION : 1.30 HOURS MAX.MARKS : 50**

**PART – A (5 X 2 = 10)**

**ANSWER ALL THE QUESTIONS.**

1. Define fouriers law of heat conduction.
2. Define efficiency and fin effectiveness.
3. Define velocity and thermal boundary layers.
4. Define Thermal Conductivity.
5. Give examples of use of fins in various engineering applications.

**PART – B (4 X 10 = 40)**

**ANSWER ALL THE QUESTIONS.**

1)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 C. Calculate°C and outside air temperature is -5°respectively. Interior room temperature is 22 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.

2) A steel tube (K = 43.26 W/mK) of 5.08 cm inner diameter and 7.62 cm outer diameter is covered with 2.5 cm layer of insulation (K = 0.208 W/mK) the inside surface of the tube receivers heat from a hot C with heat transfer co-efficient of 28 W/m2K. While the outer surface°gas at the temperature of 316 C with heat transfer co-efficient of 17 W/m2K. Calculate heat loss°exposed to the ambient air at 30 for 3 m length of the tube.

3) 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.

4. A pipe consists of 100 mm internal diameter and 8mm thickness carries steam at 170°C. The convective heat transfer coefficient on the inner surface of pipe is 75 W/m2C. The pipe isinsulated 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. Suggest the materials used for insulation.

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