TE - ME.
Sem V (old)
HMT

10/12/2014

(OLD COURSE) **QP Code : 12132**

(3 Hours) **[Total Marks : 100**

N.B. 1. Question no. **1** is compulsory.
2. Answer any **four** from the remaining **six** questions.
3. Assume suitable data wherever necessary.
4. Figure to the right indicates full marks.

1 Answer any **five** of the following : **20**

(a)Explain the physical significance of Thermal Diffusivity

(b)Write the second boundary condition for Finite Fin with insulated end, and Fin of infinite length.

(c) State and prove Kirchoff's law of radiation.

(d)Explain the significance of "Time constant" related to transient heat conduction.

(e)What is the physical significance of Reynolds number and Nusselt number ?

(f)Explain bulk mean temperature and correction factor related to Heat exchangers.

2(a) Derive Fourier's three dimensional differential equation in the Cartesian coordinates and hence deduce expression for one dimensional steady state heat conduction **10**

(b) An electric hot plate is maintained at a temperature of 350^0C and is used keep a solution boiling at 95^0 C. The solution is contained in a cast iron vessel of wall thickness 25 mm which is enameled inside to a thickness of 0.8 mm. The heat transfer coefficient for the boiling solution is 5.5 kW/ m^2 K and thermal conductivities of cast iron and enamel are 50 and 1.05 W/ mK respectively.
Calculate 1) the overall heat transfer coefficient.
2) the rate of heat transfer per unit area. **10**

3 (a) Derive an expression for logarithmic mean temperature difference of Parallel flow heat exchanger and state the assumptions clearly **8**

(b) The flow rates of hot and cold water streams running through a parallel flow heat exchanger are 0.2 kg/s and 0.5 kg/s respectively. The inlet temperature on the hot and cold sides are 75° C and 20° C respectively. The exit temperature of hot water is 45°C . If the individual heat transfer coefficients on both sides are 650 W/ m^2 ^{0}C, calculate the area of the heat exchanger. **12**