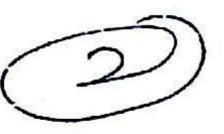


مراج انج



QP Code: 3393

4. (a) One end of a very long aluminium rod of 3mm in diameter is connected to a wall at 140° C while the other end prodrudes into a room whose air temperature is 288K. Determine the total heat dissipated by a rod.

10

10

20

10

10

k for aluminium = 150 W/mK

h between rod surfaces and environment = 300 W/mK

(b) Two large parallel plates of emivite is 0.1 and 0.05 at absolute temperature of 350K and 300K are situated 2.5mm apart in air. Calculate the total heat transfer per unit area.

Data: k air = 0.026W/mK

 $\sigma = 5.67 \times 10^{-8} \, \text{W/m}^2 \text{K}^4$

0.5 kg/sec of ethylene glycol flows through a thin walled copper tube of 1.25 cm diameter. 0.375 kg/s of water flows in the opposite direction through the annular space formed by this tube and a tube of diameter 2cm. The ethylene glycol, which enters at 100°C is required to leave at 60°C, while the water enters at 10°C.

Calculate the length of heat exchanger required Neglect resistance of copper tube wall.

The properties of water and ethyle glycol at at their bulk temperatures are listed below.

Property	Ethyle glycol at 80°C	Water at 27°C.
$\rho (kg/m^3)$	1078	995
$\mu(kg/m.s)$	3200×10 ⁻⁶	853×10 ⁻⁶
$C_p(kJ/kgK)$ k(W/mK)	2650	4180
k(W/mK)	0.261	0.614
Assume tube	are clean so fouling is a	250

Assume tube are clean so fouling is zero.

6. (a) Define:- (i) Wein's displacement law

(ii) Plank's law

(iii) Monochromatic emissive power

(iv) Monochromatic emissivity

(v) Grey body

(b) Explain different regimes of boiling

7. (a) Derive a relation between effectiveness and NTU for a counter current heat exchanger

Dry steam at 373K condenses on the outside surface of horizontal pipe of 25mm OD. The pipe surface is maintained at 357K by circulating water through it. Determine mean average heat transfer coefficient, heat transfer per unit length of pipe. The properties of condensate at the film temperature of 350K are

$$\mu = 306 \times 10^{-6} \text{ N} - \text{s/m}^2 \text{ k} = 0.66 \text{ W/m K}$$

 $\rho = 974 \text{kg/m}^3, \lambda = 2225 \text{kJ/kg}$