(REVISED COURSE)

(3 Hours) [Total Marks : 100

Attempt total **five** questions.
Assume **suitable** data if **necessary.**
Figures to the **right** indicate **full** marks.

Derive expression for heat transfer through a composite cylinder, consisting of three different material of different conductivities and same length. The heating media temperature is Tg and h.t.c. is hi, and outside temp. of atmosphere is Ta with h.t.c. as ho. **10**

90 mm OD pipe with thickness 5 mm is insulated with a material of thickness 50 mm having mean thermal conductivity = 0·087 w/mk and 30 mm of other insulation having conductivity 0·064 w/mk. If the temp., of inner surface of pipe is 600K and temp. of outer surface of pipe is 300K. Find rate of heat loss for 10 m of pipe length. How much Ice will melt due to this heat, if latent heat is 580 cal/kg ? **10**

With the half of dimensional Analysis, show that Nusselt Number is function of Rc and Pr for forced convection. **10**

Show that Nusselt number is function of Grayshoft Number and prandtl number for Natural convection. **10**

heat exchanger has heat transfer coefficient 1000 w/m^{2}k on a side whose surface area is 100 ^{2}. Calculate outer temperature 0°C of hot and cold fluids for co-current and contercurrent ow. If **20**

Hot fluid inlet Temperature	= 500 k
Cold fluid Inlet Temperature	= 310 K
Mass flow rate of hot fluid	= 5 kg/s
Mass flow rate of cold fluid	= 6 kg/s
Specific heat of hot fluid	= 3·125 kJ/kg
Specific heat of cold fluid	= 4·184 kJ/kg

Derive equation for heat exchange between two parallel-plate of different emissivities ϵ_1 and ϵ_2. maintained of Temperatures T_1 and T_2. **12**

Define : **8**

(i) Radiosity and Irradiation
(ii) Shape factor
(iii) Radiation shield
(iv) Wein's Law.

A rectangular duct 30 cm × 20 cm in cross section carries cold air. If temperature of outer surface duct is 5°C and surrounding Temperature is 25°C. Find the heat gain by the duct assuming 1·5 m duct is expressed to air in vertical position and length of duct is 15 m. properties of air at 15°C are **12**

ρ = 1·2 kg.m^3, μ = 1·827 × 10^{-5} kg/ms
υ = 1·4 × 10^{-7} m^2/s C_p = 1·005 kJ/kg/k
K = 0·0256 w/mk

Steel ball 50 mm is dia in suddenly quenched in a controlled atmosphere mentioned at 100°C. The initial Tempeature of ball is 800°C. Determine the time taken by ball to reach a temperature of 170°C. Take h = 10 w/m^2/k, K = 42·3 w/mk ρ = 7850 kg/m^3. C_p = 0·5 kJ/kg/K. **8**

Derive expression for calculating the areas and intermediate temperature for triple effect evaporator. **12**

Compare coefficient feeding arrangements of multiple effect evaporator. **8**

rite short notes on any **three** :— **20**

(a) Plate heat exchanger
(b) Wilson's plot
(c) Nusselt theory of condensation
(d) Regimes of pool boilling
(e) Effective mass factor for heat exchanger.