Question Bank

1. Define fin efficiency and effectiveness.
2. What do you understand by a gray and blackbody?
3. State Wien's displacement law and Kirchoffs law.
4. Mention the difference between free and forced convection.
5. What is the importance of boundary layer?
6. State the difference between filmwise and dropwise condensation.
7. Sketch the temperature variations in parallel flow and counter flow heat exchangers.
8. Define molar concentration and mass fraction.
9. State Fick's law of diffusion and give its expression.

PART B - (5 x 16 = 80 marks)

10. (i) Discuss the general arrangement of parallel flow, counter flow and cross flow heat exchangers. (6)

    (ii) In a double pipe counter flow heat exchanger 10000 kg/h of an oil having a specific heat of 2095 J/kgK is cooled from 80*C to 50*C by 8000 kg/h of water entering at 25*C. Determine the heat exchanger area for an overall heat transfer coefficient of 300 W/M2K. Take Cp for water as 4180 J/kgK.

11 What do you understand by critical radius of insulation and give its expression?

12. (a) (i) Explain the different modes of heat transfer with appropriate expressions. (6)

(ii) A composite wall consists of 10 cm Thick layer of building brick, k = 0.7 W/mK and 3 cm thick plaster, k = 0.5 W/mM An insulating material of k = 0.08 W/mK is to be added to reduce the heat transfer through the wall by 40%. Find its thickness. (10)

Or

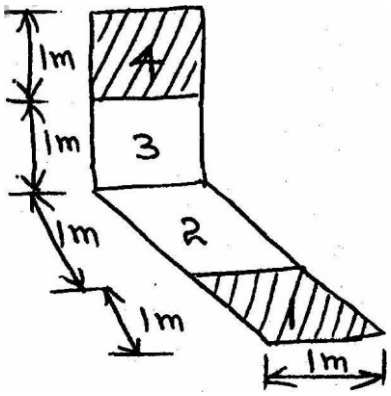
(b) Circumferential aluminium fins of rectangular profile (1.5 cm. wide and 1 mm thick) are fitted on to a 90 mm engine cylinder with a pitch of 10 mm. The height of the cylinder is 120 mm. The cylinder base temperature before and after fitting the fins are 200'C and 150'C respectively. Take ambient at 30'C and h(average) = 100 W/m^2K. Estimate the heat dissipated from the finned and the unfinned surface areas of cylinder body. (16)

13. (a) (i) Define emissivity, absorptivity and reflectivity. (6)
(ii) Describe the phenomenon of radiation from real surfaces. / (10)

Or

(b) What are radiation view factors and why are they used? (4)

(ii) Determine the v ew factor (F14) for the figure shown below. (12)



14. (a) (i) What is Reynold's analogy9- Describe the relation between fluid friction and heat transfer? (4)

(ii) Air at 251C flows over 1 m x 3 m (3 m long) horizontal plate maintained at 200'C at 10 m/s. Calculate the average heat transfer coefficients for both laminar and turbulent regions. Take Re (critical) 3.5 x 105. (12)

Or

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(i) Define Reynold's, Nusselt and Prandtl numbers.

(ii) A steam pipe 10 cm outside diameter runs horizontally in a room at 23'C. Take the outside surface temperature of pipe as 1651C. Determine the heat loss per unit length of the pipe.

(i) Discuss the various regimes of pool boiling heat transfer.

(ii) Dry saturated steam at a pressure of 2.45 bar condenses on the surface of a vertical tube of height 1 m. The tube surface temperature is kept at 117'C. Estimate the thickness of the condensate film and the local heat transfer coefficient at a distance of 0.2 m from the upper end of the tube.

Or

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(i) A mixture of $O_2$and N_2 with their partial pressures in the ra^io 0.21 to 0.79 is in a container at 25'C. Calculate the molar concentration, the mass density, the mole fraction and the mass fraction of each species for a total pressure of I bar. What would be the average molecular weight of the mi x<u\<

(ii) Discuss the analogy between heat and mass transfer.