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[5559]-216

S.E. (Chemical) (Second Semester) EXAMINATION, 2019

HEAT TRANSFER

(2015 PATTERN)

Time : 2 Hours

Maximum Marks : 50

1. Neat diagrams must be drawn wherever necessary.
2. Figures to the right indicate full marks
3. Assume suitable data, if necessary.
4. Use of Logarithmic tables; slide rule, Molier Charts, Electronic pocket Calculator & Steam tables is allowed.

Q1) a) Explain the different modes of Heat Transfer with laws ? 06

b) By dimensional analysis derive the following relationship for forced convection heat transfer process: 06

$$Nu = A (Re)^a (Pr)^c$$

OR

Q 2) a) What is dimensional analysis? Explain different methods of dimensional analysis? 06

b) Derive the steady state heat Conduction equation for composite Sphere? 06

Q 3) a) Differentiate between Natural and Forced Convection 06

b) Calculate the heat flux emitted due to thermal radiation from a black surface at 5700 ° C. At what wavelength is the monochromatic emissive power maximum & what is the maximum value? 06

OR

Q 4) a) A hollow cylinder of 20 mm inner diameter & 30 mm outer diameter is maintained at 350 K (outer surface temp) & 420 K (inner surface temp). Determine the heat loss per unit length & also determine the temperature at a distance of 3 mm from outer surface towards the center. Thermal conductivity of material is 50 W/m K 06

b) What is Radiation? Differentiate between Specular & Diffused reflection? 06

P.T.O.

- Q 5) a) What is heat exchanger ? Give the detail classification of Heat Exchanger? 06
- b) A shell & tube heat exchanger is to be provided with tubes of 31 mm outer diameter & 27 mm inner diameter, 4 m long. It is required for heating water from 295 K to 318 K with the help of condensing steam at 393 K on the outside of tubes. Determine the number of tubes required if water flow rate is 10 kg/sec. Heat transfer coefficient on steam side & water side are $6000 \text{ W/m}^2 \text{ K}$ & $850 \text{ W/m}^2 \text{ K}$ respectively. Neglect all other resistances. 07
- OR**
- Q 6) a) Water at the rate of 68 kg/min. is heated from 35°C to 75°C by oil having a specific heat of $1.9 \text{ KJ/Kg}^\circ \text{C}$. The fluids are used in a counter flow double pipe heat exchanger, and the oil enters the exchanger at 110°C and leaves at 75°C . The overall heat-transfer coefficient is $320 \text{ W/m}^2 \text{ }^\circ \text{C}$. Calculate the heat-exchanger area. 08
- b) Explain Fouling factor & Log mean temperature difference in connection with Heat Exchanger? 05
- Q 7) a) What is Evaporation? Explain classification of Evaporators? 05
- b) An evaporator operating at atmospheric pressure (101.325 kPa) is fed at the rate of 10000 kg/hr of weak liquor containing 4% caustic soda. Thick liquor leaving the evaporator contains 25% caustic soda. Find the capacity of the evaporator? 08
- OR**
- Q 8) a) What are multiple effect evaporators? Explain Calendira type of Evaporator? 06
- b) What is Capacity & Economy of evaporator? Explain Vacuum evaporation? 07