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Roll No .....

ME-701-CBGS

B.Tech., VII Semester

Examination, December 2020

Choice Based Grading System (CBGS)

Heat and Mass Transfer

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

1. a) What do you mean by contact resistance? 7
   b) Explain the modes of heat transfer. 7

2. a) What do you mean by fouling in heat exchanger? 7
   b) Differentiate between fin effectiveness and fin efficiency. 7

3. a) Explain the term 'Boiling'? 7
   b) Give the conduction. statement of Fourier's law of heat. 7

4. a) Define the critical thickness of insulation? Derive equation for sphere with suitable sketch. 7
   b) What do you mean by radiation? Derive the general equation for n shields. 7

5. a) Derive the general equation for infinite long fin with neat sketch. 7
   b) Differentiate between Forced and Natural convection and also explain the phenomenon of Film wise and Drop wise condensation. 7

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6. a) A plate of length 750 mm and width 250 mm has been placed longitudinally in a steam of crude oil which flows with a velocity of 5 m/s. if the oil has a specific gravity of 0.8 and kinematic viscosity of 1 stroke, calculate: 7
   i) Boundary layer thickness at the middle of plate
   ii) Shear stress at the middle of plate
   iii) Friction drag on one side of the plate.

   b) The exhaust gases (Cp = 1.12 kJ/kg-K) flowing through a tubular heat exchanger at the rate of 1200 kg/hr are cooled from 400°C to 120°C. The cooling is affected by water. (Cp = 4.18 kJ/kg-K) that enters the system at 10°C at the rate of 1500 kg/hr. If the overall heat transfer coefficient is 500 kJ/m^2 -hr- K. What heat exchanger area is required to handle the load for
   i) Parallel flow
   ii) Counter flow arrangement? 7

7. a) Derive the general heat conduction equation for spherical co-ordinates. 7

   b) Derive an expression for energy equation of thermal boundary layer over a flat plate. 7

8. a) Write down the significance of Reynolds and Nusselt number. 7

   b) Explain the equation for the LMTD method for the parallel flow arrangement. 7

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