

BACHELOR OF TECHNOLOGY (C.B.C.S.) (2020 COURSE)

B.Tech.Sem - III CHEMICAL : : SUMMER - 2022

SUBJECT : PROCESS HEAT TRANSFER

Day : Tuesday
Date : 31-05-2022

S-24433-2022

Time : 02:30 PM-05:30 PM
Max. Marks : 60

N.B.:

- 1) All questions are **COMPUSLROY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of non-programmable scientific **CALCULATOR** is allowed.
- 4) Draw neat and labeled diagram **WHEREVER** necessary.
- 5) Assume suitable data if necessary.

Q.1 Which are modes of heat transfer? Which are factors controlling heat conduction? How temperature and pressure affect thermal conductivity? **[10]**

OR

Q.1 Flat furnace wall consists of 4.5 inch layer of silicate brick (thermal conductivity 0.08 Btu/ft.h.⁰F) and 9 inch layer of refractory (conductivity 0.8 Btu/ft. h. ⁰F). Temperature of inner and outer face of furnace is 140⁰ and 170⁰ F. What is heat loss through wall and temperature of interface between two brick layer? **[10]**

Q.2 A three layered wall separates mixture of ice and water from surrounding at 32⁰F which is constant during melting of ice. Outside layer is of low carbon steel with 0.04 inch thickness (thermal conductivity k=24.8 Btu/hr.ft.⁰F) 3/4 inch thickness (k = 0.02 Btu/hr.ft.⁰F) insulating material is styrene foam of and inside glass layer with 1/4 inch thickness (k = 0.09 Btu/hr. ft.⁰F). Outside air temperature is 90⁰F with air steel convection coefficient is 0.79 Btu/hr.ft².⁰F) and inside convection coefficient between water and glass is 150 Btu/hr.ft².⁰F. Determine the heat transfer rate through the wall per sq.ft area and overall heat transfer coefficient. **[10]**

OR

Q.2 What is thermal contact resistance? How it affects overall heat transfer during use of layered material? **[10]**

Q.3 What is natural convection? How heat transfer takes place on flat plate by natural convection? Which are the controlling factors? **[10]**

OR

Q.3 A sloping wall is maintained at uniform temperature of 140⁰F with ambient air is at 85⁰F. The wall dimensions are 30 × 18 ft. with convective heat transfer coefficient of 3 Btu/hr.ft².⁰F. Determine heat transfer by convection to air. Also comment upon heat currents and flow patterns. **[10]**

Q.4 Which are different zones of boiling? How they affect heat transfer? **[10]**

OR

Q.4 Which are the types of condensation? How they control the heat transfer properties? **[10]**

Q.5 What is radiation? How heat transfer takes by radiation? Which are controlling factors? **[10]**

OR

Q.5 How heat transfer takes place in case of radiation combined with conduction and convection? Which are the controlling parameters? **[10]**

Q.6 How heat transfer takes place in mechanically agitated contactors (MAC)? Which are MAC configuration and their effect on overall heat transfer? **[10]**

OR

Q.6 How heat transfer takes place in multiphase reactors? Which are the factors affecting heat transfer between phases? **[10]**

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