GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV EXAMINATION – SUMMER 2025

Subject Code:3140503   **Date:12-05-2025**
Subject Name: Heat Transfer
Time: 10:30 AM TO 01:00 PM   **Total Marks:70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

MARKS

Q.1	**(a)**	Explain thermal conductivity of gases, liquid and solids.	**03**
	(b)	Enlist the property of Insulating material.	**04**
	(c)	Explain in brief various laws of radiation.	**07**
Q.2	**(a)**	Enlist different types of fins with neat sketch.	**03**
	(b)	Derive an expression for heat flow through a cylinder.	**04**
	(c)	A furnace is constructed with a 24 cm thick layer of fire brick, 12 cm thick layer of insulating brick and followed by a 24 cm thick layer of building brick. The inside temperature of the furnace is 950 °C and the outside temperature is 55 °C. The thermal conductivities of fire brick, insulating brick and building brick are 6.05, 0.59 and 2.4 W/(m °C). Find the heat loss per unit area and the temperature at the interfaces.	**07**

OR

	(c)	Derive equation for heat transfer through a composite wall made up of 3 different materials in close thermal contact with each other, with no heat loss to surrounding.	**07**
Q.3	**(a)**	Give the physical significance of Prandlt No., Nusselt No. and Grashoff No.	**03**
	(b)	Explain natural convection phenomenon.	**04**
	(c)	Using Dimension analysis derive expression for forced convection for the fluid flowing inside tube in a turbulent flow.	**07**

OR

Q.3	**(a)**	Explain the terms absorptivity, emissivity, transmissivity and reflectivity for heat transfer by radiation.	**03**
	(b)	Define the black body and Give applications where this concept is used in heat transfer.	**04**
	(c)	Discuss with the help of diagram various regimes of pool boiling. What is the use of finding critical flux and critical temperature drop?	**07**
Q.4	**(a)**	Draw the temperature profiles of cold and hot fluids for true co-current and counter –current flow in double pipe heat exchanger.	**03**
	(b)	Discuss the Concept of fin Effectiveness.	**04**
	(c)	Derive the equation for LMTD and explain its importance.	**07**

OR

Q.4	**(a)**	When LMTD correction factor is used in heat exchanger calculation?	**03**
	(b)	Derive an equation for Overall heat transfer coefficient in double pipe heat exchanger.	**04**
	(c)	Explain in details with neat sketch: Shell & Tube heat exchangers.	**07**
Q.5	**(a)**	Define capacity and economy of evaporator.	**03**
	(b)	Explain working of Vertical Tube Evaporator.	**04**
	(c)	Derive the material and energy balances for multi effect evaporator.	**07**

Q.5 **(a)** Differentiate between forward feed and backward feed in a multiple effect evaporator with a neat sketch. **03**

(b) Write short notes on Vapor recompression in evaporator. **04**

(c) Write a short note on Multiple Effect Evaporator **07**

****