Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2022

Subject Code:3140503   **Date:27-06-2022**
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)**	Define: Heat & Temperature. How it can be differ from each other.	**03**
	(b)	The temperature at the inner and outer surfaces of a boiler wall made of 20 mm thick steel and covered with an insulating material of 5 mm thickness are 3000^0C and 500^0C respectively. If the thermal conductivities of steel and insulating material are $58W/m^0C$ and $0.116 W/m^0C$ respectively, determine the rate of flow through the boiler wall.	**04**
	(c)	Derive equation for heat transfer by conduction through composite wall. Also mention assumptions made for it.	**07**
Q.2	**(a)**	Discuss the Physical significance of (i) Nusselt Number (ii) Grashoff Number (iii) Biot Number.	**03**
	(b)	Explain Velocity boundary layer & Thermal boundary layer. Which dimensionless number is related to it? How?	**04**
	(c)	A vertical pipe 80 mm diameter and 2 m height is maintained at a constant temperature of 120^oC.The pipe is surrounded by still atmospheric air at 30^oC.Find heat loss by natural convection.	**07**
		OR	
	(c)	Derive the equation of overall heat transfer co-efficient(U) from the individual heat transfer co-efficient(h) with neat sketch.	**07**
Q.3	**(a)**	Define: Thermal Conductivity. Enlist the factors on which thermal conductivity of a substance would be dependent.	**03**
	(b)	How would you distinguish between the following: black body, white body, transparent body and opaque body.	**04**
	(c)	What is boiling and when does it occurs? Explain Nucleate boiling.	**07**
		OR	
Q.3	**(a)**	Explain basic law for heat conduction.	**03**
	(b)	State and prove Stefan Boltzmann law relating to thermal radiation and temperature of a radiating body.	**04**
	(c)	Define Condensation. Explain filmwise condensation & Dropwise condensation.	**07**
Q.4	**(a)**	Define: Tube Pitch, Baffle Spacing & Range.	**03**
	(b)	What do you mean by "fouling" in heat exchangers? What is the effect of it on performance of heat exchangers?	**04**
	(c)	Explain design steps for Shell &Tube heat exchanger in detail. Draw neat sketch of 2-4 pass shell & tube heat exchanger.	**07**
		OR	
Q.4	**(a)**	Define Fin. Enlist different types of it. Differ Transverse fin with longitudinal fin.	**03**

(b)	Explain Heat transfer effectiveness and number of transfer units (NTU).	**04**
(c)	What is LMTD? List out its assumptions. Derive the equation for LMTD for counter current flow.	**07**

Q.5	**(a)**	How can you measure performance of evaporators?	**03**
	(b)	What is Evaporation? Distinguish Natural circulation & forced circulation evaporators.	**04**
	(c)	Discuss various methods of feeding in multiple effect evaporators with their relative merits and demerits.	**07**

OR

Q.5	**(a)**	Explain Duhring rule & Boiling point Elevation.	**03**
	(b)	What are the Properties of evaporating liquids that influence the process of evaporation?	**04**
	(c)	What are the various types of evaporators? Draw neat sketch of falling film evaporator and briefly explain its construction and working.	**07**

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