Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– VI (Old) EXAMINATION – WINTER 2019

Subject Code: 161906 **Date: 17/12/2019**

Subject Name: Heat And Mass Transfer

Time: 02:30 PM TO 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of gas and steam tables are permitted.**

Q.1	**(a)**	Derive general heat conduction equation in cylindrical co-ordinates with figure	**07**
	(b)	Derive equation of critical thickness of insulation. Explain its significance.	**07**
Q.2	**(a)**	Derive equations of temperature distribution and heat dissipation for fin non-insulated at tip	**07**
	(b)	The walls of a house in cold region consists of three layers- an outer brick work, 15 cm thick, an inner wooden panel, 1.2 cm thick, the intermediate layer is made of an insulating material, 7cm thick. The thermal conductivities of brick and wood used are 0.7 W/m-K and 0.18 W/m-K, respectively. The inside and outside temperature of composite wall are 21 ^{0}C and -15 ^{0}C, respectively. If the layer of insulation offers twice the thermal resistance of the brick wall, calculate (i) the rate of heat loss per unit area of the wall, and (ii) thermal conductivity of insulating material.	**07**
		OR	
	(b)	Explain fin efficiency and fin effectiveness related to thermal performance of fins.	**07**
Q.3	**(a)**	State and derive Wien's Displacement Law.	**07**
	(b)	Air velocity of 3m/s and at 20 ^{0}C flows over a flat plate along its length. The length width and thickness of the plate are 100 cm, 50 cm and 2 cm respectively. The top surface of the plate is maintained at 100 ^{0}C. Calculate the heat lost by the plate and temperature of bottom surface of the plate for the steady state conditions. Take k_{plate} = 23 W/m-K.	**07**
		OR	
Q.3	**(a)**	Derive Von Karman integral equation for momentum transfer in laminar boundary layer.	**07**
	(b)	What is boiling? Explain pool boiling regimes.	**07**
Q.4	**(a)**	Explain film wise and drop wise condensation.	**07**
	(b)	Define the following in relation with mass transfer (i) Schmidt number (ii) Lewis number (iii) Sherwood number	**07**
		OR	
Q.4	**(a)**	State and explain Fick's law of diffusion. Express Fick's law in terms of partial pressures of gases	**07**
	(b)	How are the heat exchangers classified?	**07**
Q.5	**(a)**	Write short note on heat pipe.	**07**
	(b)	Derive LMTD equation for parallel flow heat exchanger	**07**
		OR	
Q.5	**(a)**	Describe the phenomenon of radiation from real surfaces.	**07**
	(b)	Derive equation of heat transfer with radiation shield between two surfaces.	**07**

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