Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2024

Subject Code:3171911 Date:16-12-2024

Subject Name: Advanced 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 Non periodic and periodic heat conduction with examples?	**03**
	(b)	List common applications of finned surfaces.	**04**
	(c)	Write the general heat conduction equation for Cartesian co-ordinates. Derive the Write the general heat conduction equation for cartesian co-ordinates. Derive the equation for Steady state with internal heat generation. Write the general heat conduction equation for Cartesian co-ordinates. Derive the equation for following condition: (1) Steady state with internal heat	**07**
Q.2	**(a)**	Define thermal contact resistance? Upon what parameters does this resistance depend?	**03**
	(b)	What is lumped parameter analysis? How it is differ from Heisler's chart analysis?	**04**
	(c)	Explain the analytical method for two dimensional steady state heat conduction in rectangular plate.	**07**
		OR	
	(c)	Explain radial fins of rectangular and hyperbolic profiles- longitudinal fin of rectangular profile radiating to free space.	**07**
Q.3	**(a)**	What is thermal symmetry boundary condition? How it is expressed mathematically?	**03**
	(b)	Define: Nusselt Number, Prandtl Number	**04**
	(c)	How do numerical solution methods differ from analytical ones? Explain finite difference method for solving multi-dimensional steady state heat conduction problems.	**07**
		OR	
Q.3	**(a)**	Explain effectiveness of fin.	**03**
	(b)	Explain lumped capacity? Also write the assumptions for the same in detail?	**04**
	(c)	Draw the boiling curve and identify the burnout point on the curve. Explain how burnout is caused. Why is the burnout point avoided in the design of boilers?	**07**
Q.4	**(a)**	Explain with neat sketch why is the flow separation in flow over cylinders delayed in turbulent flow?	**03**
	(b)	Explain the concept of free and forced convection with suitable examples.	**04**
	(c)	Discuss different boiling regimes in the boiling process.	**07**
		OR	
Q.4	**(a)**	What are the effects of non-condensable gases in condensing equipment?	**03**
	(b)	Define following finite difference terms: 1) Node 2) Network	**04**
	(c)	What is the difference between film and drop wise condensation? Which is a more effective mechanism of heat transfer?	**07**

Q.5	**(a)**	Explain Kirchhoff's law.	**03**
	(b)	What is radiation? Define intensity of radiation.	**04**
	(c)	Write a short note on greenhouse effect.	**07**
		OR	
Q.5	**(a)**	Define following terms. 1) Emissivity 2) Solid Angle	**03**
	(b)	Explain radiation effect on temperature measurement.	**04**
	(c)	Derive expressions for the radiation heat exchange for two gray surfaces connected by single refractory surface.	**07**

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