Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023

Subject Code:3171911 Date:19-12-2023

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.**

Q.1	**(a)**	Define thermal contact resistance? Upon what parameters does this resistance depend?	**03**
	(b)	Write the general heat conduction equation for Cartesian co-ordinates. Derive the equation for following condition: (1) Steady state with internal heat generation (2) Unsteady state without internal heat generation	**04**
	(c)	Explain finite difference method for two-dimensional steady heat conduction.	**07**
Q.2	**(a)**	Define Biot number. State its significance in transient heat.	**03**
	(b)	Explain lumped capacity? Also write the assumptions for the same in detail?	**04**
	(c)	From the general equation derive the equation of heat dissipation for infinitely long fin.	**07**
		OR	
	(c)	Derive Temperature distribution relation for cylinder with Steady state and uniform heat generation.	**07**
Q.3	**(a)**	Explain the function of extended surfaces with classification	**03**
	(b)	What is a thermal symmetry boundary condition? How is it expressed mathematically?	**04**
	(c)	Define these terms used in the finite difference formulation: node, nodal network, volume element, nodal spacing, and difference equation	**07**
		OR	
Q.3	**(a)**	Interpret Grashof number and Rayleigh number with mathematical formula. Also explain their significance in natural convection heat transfer.	**03**
	(b)	Explain with neat sketch why is the flow separation in flow over cylinders delayed in turbulent flow?	**04**
	(c)	Define: Nusselt Number, Reynolds Number, Prandtl Number and give conventional generalized basic equation for forced convection using these numbers.	**07**
Q.4	**(a)**	Write a short note on liquid-metal heat transfer?	**03**
	(b)	What are the effects of non-condensable gases in condensing equipment?	**04**
	(c)	What is an irregular boundary? What is a practical way of handling irregular boundary surfaces with the finite difference method?	**07**
		OR	
Q.4	**(a)**	Write a short note high velocity flow?	**03**
	(b)	Draw the boiling curve and identify the burnout point on the curve	**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 Radiation shape factor.	**03**
	(b)	Write a short note on greenhouse effect.	**04**
	(c)	Write a note on Emissivity and absorptivity of gases and gas mixtures	**07**
		OR	
Q.5	**(a)**	Write the statement of Kirchoff's low and define emissivity	**03**
	(b)	Explain all the different mechanisms of heat transfer from the human body (a) through the skin and (b) through the lungs	**04**
	(c)	Derive the equation of heat flow between infinite long parallel plates.	**07**

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