

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – WINTER 2021****Subject Code:3171911****Date:29/12/2021****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 thermal contact resistance? Upon what parameters does this resistance depend?	03
	(b) What is a thermal symmetry boundary condition? How is it expressed mathematically? How is the boundary condition on an insulated surface expressed mathematically?	04
	(c) Define these terms used in the finite difference formulation: node, nodal network, volume element, nodal spacing, and difference equation	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) Explain radial fins of rectangular and hyperbolic profiles- longitudinal fin of rectangular profile radiating to free space.	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) 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
OR		
Q.3	(a) Interpret Grashof number and Rayleigh number with mathematical formula. Explain their significance in natural convection heat transfer analysis in 100 words.	03
	(b) Prove that fully developed flow in a tube subjected to constant surface heat flux, the temperature gradient is independent of x and thus the shape of the temperature profile does not change along the tube.	04
	(c) State eight assumptions of Nusselt theory of condensation. (Laminar film condensation on a vertical plate)	07
Q.4	(a) Write a short note on high velocity flow?	03
	(b) What are the effects of non-condensable gases in condensing equipments?	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 on liquid-metal heat transfer? **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) Give examples of radiation effects that affect human comfort. **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) Write a note on Emissivity and absorptivity of gases and gas mixtures. **07**

OR

- Q.5** (a) Explain Radiation shape factor in detail. **03**
(b) How does the wavelength distribution of radiation emitted by a gas differ from that of a surface at the same temperature? **04**

- (c) What is latent heat? How is the latent heat loss from the human body affected by (a) skin wettedness and (b) relative humidity of the environment? How is the rate of evaporation from the body related to the rate of latent heat loss **07**
