

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2018****Subject Code:2153613****Date:16/11/2018****Subject Name:Basics of 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.

		MARKS
Q.1	(a) Explain mode of heat transfer.	03
	(b) Explain Fourier's law and Newton's law of cooling.	04
	(c) Derive an expression for steady state heat conduction through hollow sphere.	07
Q.2	(a) What do you mean by convection? How do you differentiate between free and force convection?	03
	(b) A hot plate $1\text{m} \times 1.5\text{m}$ is maintained at 300°C . Air at 20°C blows over the plate. If the convective heat transfer coefficient is $20\text{ W/m}^2\text{ }^{\circ}\text{C}$, calculate the rate of heat transfer.	04
	(c) Explain extended surface with different types. Derive the expression for heat transfer from infinitely long fin.	07
	OR	
	(c) A furnace wall is composed of 250 mm of fire bricks, 200 mm of common brick, 50 mm of 85% magnesia and 3 mm of steel plate on outside. If the inside surface temperature is 1800 K and outside surface temperature is 363 K, estimate the temperature between layer and calculate the heat loss. Assume k (for fire brick) = 4 W/(m.K) , k (for common brick) = 2.8 W/(m.K) , k (85% magnesia) = 0.24 W/(m.K) and k (for steel) = 240 W/(m.K) .	07
Q.3	(a) List out various laws of radiation and explain any one in detail.	03
	(b) Write Dittus Boelter equation to compute heat transfer coefficient. Explain all the terms with their SI units	04
	(c) Lubricating oil used in gear box of a 14000 rpm high speed blower is being recycled continuously through a double pipe counter current heat exchanger for cooling. The oil is cooled from 70°C to 40°C at the rate of 1000 kg/h using water entering at 28°C . The water temperature at exit should not exceed 42°C . The specific heat of oil is $2.05\text{ kJ/kg }^{\circ}\text{C}$ and that of water is $4.17\text{ kJ/kg }^{\circ}\text{C}$. Calculate required rate of flow of water. If the heat exchanger area is 3.0 m^2 , calculate the overall heat transfer coefficient.	07
	OR	
Q.3	(a) Give the physical significance of : Fourier's Number, Biot number and Reynolds number	03
	(b) Explain hydrodynamic and thermal boundary layers.	04
	(c) What is critical radius? Why it is necessary? Derive expression of critical radius for Spherical shape.	07
Q.4	(a) Explain with neat sketch falling film evaporator.	03
	(b) Explain feeding arrangements in multi effect evaporator (any one)	04
	(c) What are different flow arrangements in heat exchanger? Derive the equation for L.M.T.D. in co-current flow heat exchanger.	07

OR

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| Q.4 | (a) | Explain construction and working of plate heat exchanger with neat sketch. | 03 |
| | (b) | Explain boiling point elevation and duhring's rule | 04 |
| | (c) | Derive the expression for Reynolds analogy. | 07 |
| Q.5 | (a) | Elaborate the concept of Black Body and Grey Body. | 03 |
| | (b) | Explain film wise and drop wise condensation. | 04 |
| | (c) | Explain shell and tube heat exchanger. | 07 |

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| Q.5 | (a) | Explain the construction and working of calendria type evaporators | 03 |
| | (b) | What is evaporation economy? Which are the different method for increase economy? | 04 |
| | (c) | What is condensation? What are the different factors which affects condensation? | 07 |

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