

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – WINTER 2021****Subject Code:3143611****Date:03/01/2022****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.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Write down the modes of heat transfer with suitable examples.	03
	(b) Elaborate the general methods for estimation of convection heat transfer coefficient.	04
	(c) Explain the construction and operation of calendria type evaporator.	07
Q.2	(a) Write down the fundamental differences in thermodynamics and heat transfer.	03
	(b) Describe the general heat conduction equation in Cartesian coordinates	04
	(c) Derive the equation of plane wall or slab of uniform conductivity without heat generation.	07
OR		
	(c) Describe different analogy between heat and mass transfer.	07
Q.3	(a) How do you differentiate between natural and forced convection?	03
	(b) Two surfaces of a plane wall of 15cm thickness and 5 m ² area are maintained at 240°C and 90°C respectively. Determine the heat transfer between the surfaces and temperature gradient across the wall if conductivity of the wall material is 18.5 W/(m-K).	04
	(c) Describe the heat transfer from extended surfaces	07
OR		
Q.3	(a) Give the physical significance of Nusselt Number.	03
	(b) Define thermal conductivity and discuss the effect of temperature on thermal conductivity of solid, liquid and gas.	04
	(c) A thin metal plate of 4 cm diameter is suspended in atmospheric air whose temperature is 290 K. the plate attains a temperature of 295 K when one of its face receives radiant energy from a heat source at the rate of 2 W. If heat transfer coefficient on both surfaces of the plate is stated to be 87.5 W/m ² -deg, workout the reflectivity of the plates.	07
Q.4	(a) What is heat exchanger? Write down the applications of heat exchanger.	03
	(b) State and explain Stefan-Boltzmann Law of radiation.	04
	(c) Draw the temperature profile in counter and parallel flow heat exchanger, why counter flow is more efficient.	07

OR

- Q.4** (a) Define the Capacity ratio with suitable equation. **03**
(b) What is the driving force for heat transfer? **04**
(c) A tubular heat exchanger is to be designed for cooling oil from a temperature of 80°C to 30°C by a large of stagnant water which may be assumed to remain constant at a temperature of 20°C. The heat transfer surface consists of 30 m long straight tube of 20 mm inside diameter. The oil (specific heat= 2.5 kJ/kg k and specific gravity=0.8) flows through the cylindrical tube with an average velocity of 50 cm/s Calculate the overall heat transfer coefficient for the oil cooler . **07**

- Q.5** (a) Write down the principle of evaporator. **03**
(b) Derive the equation of overall heat transfer coefficient through the plane wall. **04**
(c) Explain the single effect and multiple effect evaporators in details. **07**

OR

- Q.5** (a) Write down the concept of pool boiling. **03**
(b) Discuss the factors affecting condensation. **04**
(c) Explain the climbing or rising film evaporator with suitable diagram. **07**
