Enrollment No: _____

PARUL UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

B.Tech Mid Semester Exam

Semester: 4th
Subject Code: 303103251/203103251
Subject Name: Heat Transfer

Date: (29/01/2024)
Time: (1hr: 30min)
Total Marks: 40

Sr. No.		Marks
Q.1	(A) Five One line Questions 1. Define heat transfer. 2. Define the critical thickness of insulation. 3. What do you understand by insulators? 4. What is closed system? 5. Define thermal conductivity.	05
	(B) Five Fill in the blanks 1. Emissivity of the perfect blackbody is _____ . 2. The thermal resistance has the units of _____ . 3. The thermal conductivity of a gas _____ with increase in temperature. 4. Unit of heat flux is _____ . 5. At thermal equilibrium the ratio of the total emissive power to the absorptivity for all bodies is the same. This statement is known as _____ .	05
Q.2	Attempt any four (Short Questions) (1) What do you mean by convection? Explain the different types of convection. (2) Write the statement of Fourier's law of heat conduction. What are the different assumptions associated with it? (3) Write a short note on thermal diffusivity and thermal resistance. (4) Define Radiation. Write the statement of Stefan-Boltzmann Law with the mathematical formula. (5) What are the different applications of heat transfer?	12
Q.3	Attempt any two questions (1) Derive the expression for the critical thickness of insulation for a cylinder. (2) Derive the expression for the heat transfer rate, under one-dimensional steady-state heat conduction through the hollow sphere. (3) A surface at 250°C exposed to the surroundings at 110°C convects and radiates heat to the surroundings. The convection coefficient and radiation factor are 75 $W/m^2.°C$ and unity respectively. If the heat is conducted to the surface through a solid of conductivity 10 W/m.°C, what is the temperature gradient at the surface in the solid.	08
Q.4	(A) An exterior wall of a house may be approximated by a 4-inch layer of common brick [k = 0.7 W/m.°C] followed by a 1.5-inch layer of gypsum plaster [k =0.48 W/m.°C]. What thickness of loosely packed rock-wool insulation [k =0.065 W/m.°C] should be added to reduce the heat loss (or gain) through the wall by 80 percent?	05