Regulation R17 Subject code: 1P6CC

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech III Year II Semester Supplementary Examinations, February 2024

Heat Transfer

(Mechanical Engineering)

Maximum Marks: 70 Date:20.02.2024 **Duration: 3 Hours**

Note:
1. **This question paper contains two parts A and B.**
2. **Part A is compulsory which carries 20 marks. Answer all questions in Part A.**
3. **Part B consists of 10 questions. Answer any 5 questions which carries 10M.**
4. **Each question carries 10 marks and may have a, b, c, d as sub questions.**

	Part-A		
All the following questions carry equal marks (10X2M=20 Marks)		CO	Bloom Tx
1	What is the convection mode of heat transfer?	CO1	L1
2	What are the applications of heat transfer?	CO1	L1
3	What is the function of fin?	CO2	L1
4	What is critical radius of insulation?	CO2	L1
5	Differentiate the free and forced convection.	CO3	L2
6	What are the advantages of dimensional analysis?	CO3	L1
7	What is film wise condensation?	CO4	L1
8	What is the concept of shape factor?	CO4	L1
9	What is the difference between regenerator and recuperator?	CO5	L1
10	What are the advantages of NTU method over the LMTD method?	CO5	L1
	Part-B		
Answer all the questions (5X10M=50Marks)			
11	A Stainless-steel plate is of 2 cm thick is maintained at a temperature of 550^0C at one face and 50^0C on the other. The thermal conductivity of stainless steel at 300^0C is 19.1 W/m K. Calculate the heat transferred through the material per unit area? (10m)	CO1	L4
	OR		
12	Derive the general conduction equation for Cylindrical co-ordinate system? (10m)	CO1	L3
13	Briefly describe about lumped heat capacity system. Give its examples. (10m)	CO2	L2
	OR		
14	Derive the heat conduction through composite sphere? (10m)	CO2	L3
15	The resistance R experienced by a partially submerged body depends upon the velocity V, length of the body l, viscosity of the fluid μ, density of the fluid ρ and gravitational acceleration g. Obtain a dimensionless expression for R by using Buckingham π-method? (10m)	CO3	L4

	OR		
16	Derive the heat dissipation from an infinitely long fin? (10m)	CO3	L3
17	Determine the heat transfer rate by free convection from a plate 0.3m × 0.3m for which one surface is insulated and the other surface is maintained at 1100C and exposed to atmosphere air at 300C for the following arrangements: a) The plate is vertical b) The plate is horizontal with the heating surface facing up c) The plate is horizontal with the heating surface facing down (10m)	CO4	L4
	OR		
18	Hot oil (cp = 2.09 kJ/kg K) flows through a counter flow heat exchanger at the rate of 0.7kg/s. It enters at 200^0C and leaves at 70^0C. The cold oil (cp = 1.67 kJ/kg K) exits at 150^0C at the rate of 1.2 kg/s. Determine the surface area of the heat exchanger required for the purpose if the overall heat transfer coefficient is 650W/m^2K. (10m)	CO4	L4
19	Two perfectly black parallel planes 1.2 by 1.2 m are separated by a distance of 1.2 m. one plane is maintained at 800 K and the other at 500 K. The plates are located in a large room whose walls are at 300K. What is the net heat transfer between the planes? (10m)	CO5	L4
	OR		
20	Define absorptivity, reflectivity and transmissivity. (10m)	CO5	L2