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, June/July 2023

Heat Transfer

(Mechanical Engineering)

Maximum Marks: 70 Date:27.06.2023 **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)

1 Define the conduction mode of heat transfer?
2 What is thermal diffusivity?
3 What do you mean by steady state heat transfer?
4 Write any three assumptions of Fourier law of heat conduction?
5 Differentiate the free and forced convection.
6 What are the advantages of dimensional analysis?
7 What is film wise condensation?
8 What is the concept of shape factor?
9 What is the difference between regenerator and recuperator?
10 What are the advantages of NTU method over the LMTD method?

Part-B

Answer all the questions (10MX 5=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? [10]

OR

12 Derive the general conduction equation for Cylindrical co-ordinate system? [10]
13 Derive the heat conduction through composite sphere. [10]

OR

14 Briefly describe about the Emissivity. [10]

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? [10]

OR

16 Derive the heat dissipation from an infinitely long fin? [10]
17 A vertical cylinder 5 cm diameter and 1 m high is maintained at a temperature of 65^0 C in atmosphere of air at 15^0 C. Calculate the rate of heat loss by free convection from the cylinder to air. [10]

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. [10]

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? [10]

OR

20 Define absorptivity, reflectivity and transmissivity? [10]