



Regulation R18

Subject code:2P6CB

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI 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°C at one face and 50°C on the other. The thermal conductivity of stainless steel at 300°C 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°C in atmosphere of air at 15°C . Calculate the rate of heat loss by free convection from the cylinder to air. [10]

OR

- 18 Hot oil ($c_p = 2.09\text{ kJ/kg K}$) flows through a counter flow heat exchanger at the rate of 0.7 kg/s . It enters at 200°C and leaves at 70°C . The cold oil ($c_p = 1.67\text{ kJ/kg K}$) exits at 150°C 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 $650\text{ W/m}^2\text{K}$. [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 300 K . What is the net heat transfer between the planes? [10]

OR

- 20 Define absorptivity, reflectivity and transmissivity? [10]