R20 Regulation *Subject code: 3P6CB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech VI Semester Supplementary Examinations, November 2025

HEAT TRANSFER

(ME)

Maximum Marks: 70 Date: 21.11.2025 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 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

DATA BOOK ALLOWED

Part-A

All the following questions carry equal marks (10X2M=20 Marks)		Marks	CO	BTL
1	How is natural convection different from forced convection?	2M	1	L1
2	Why the negative sign is used in Fourier's law of heat conduction equation?	2M	1	L1
3	Define overall heat transfer coefficient.	2M	2	L1
4	What is lumped heat capacity method?	2M	2	L1
5	Define effectiveness of the fin.	2M	3	L1
6	Define thermal capacity.	2M	3	L1
7	What is mean by drop wise condensation?	2M	4	L1
8	What is the function of insulating materials?	2M	4	L1
9	Define regenerator and recuperator.	2M	5	L1
10	What are the advantages of NTU method over the LMTD method?	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	A Stainless-steel plate is of 2 cm thick is maintained at a temperature of 650^0C at one face and 50^0C on the other. The thermal conductivity of stainless steel at 400^0C is 22.1 W/m K. Calculate the heat transferred through the material per unit area?	10M	1	L2
	OR			
12	Derive the general conduction equation for Cylindrical co-ordinate system.	10M	1	L2
13	Briefly describe about lumped heat capacity system with examples.	10M	2	L2
	OR			
14	Derive the heat conduction through composite sphere.	10M	2	L2
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	3	L2
	OR			

16	Derive the heat dissipation from an infinitely long fin.	10M	3	L2
17	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	4	L2
	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 250^0C at the rate of 2.2 kg/s. Determine the surface area of the heat exchanger required for the purpose if the overall heat transfer coefficient is 750W/m^2K.	10M	4	L2
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	5	L2
	OR			
20	a) Define absorptivity, reflectivity and transmissivity? b) Two large parallel plates of emissivities 0.95 and 0.65 are at temperatures 327^0 C and 27^0 C respectively. A radiation shield of aluminium sheet of emissivity 0.4 is placed between two plates. Determine the shield temperature and the heat transfer rate per unit area. With the presence of the shield.	5M 5M	5	L2