Q.P. Code: 19ME0319 **R19**

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year II Semester Regular Examinations August-2022

HEAT & MASS TRANSFER

(Mechanical Engineering)

Time: 3 hours Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1	a	List the basic laws which govern the heat transfer.	L1	6M
	b	Name and explain the mechanism of heat transfer.	L2	6M

OR

2	a	What is conduction heat transfer? Explain its parameters.	L1	6M
	b	A plane wall is 150 mm thick and its wall area is 4.5 m2. If its conductivity is 9.35 W/m 0C and surface temperature are steady at 150 0C and 45 0C, determine i).Heat transfer across the plane wall, ii).Temperature gradient in the flow direction	L4	6M

UNIT-II

3	a	Sketch various types of fins. Give examples of use of fins in various engineering applications.	L3	6M
	b	Calculate the amount of energy required to solder together two very long pieces of bare copper wire 1.5 mm diameter with solder that melts at 190 0C. The wires are positioned vertically in air at 20 0C. Assume that the heat transfer coefficient on the wire surface is 20 W/m2 0C and thermal conductivity of wire alloy is 330 W/m 0C.	L4	6M

OR

4	a	A 50 cm x 50 cm copper slab 6.25 mm thick has a uniform temperature of 300 ^{0}C. Its temperature is suddenly lowered to 36 ^{0}C. Calculate the time required for the plate to reach the temperature of 108. Take ρ = 9000 kg/m^3, c = 0.38 kJ/kg ^{0}C, k = 370 W/m ^{0}C and h = 90 W/m^2 ^{0}C.	L4	6M
	b	What is lumped system analysis? Derive the expression for it.	L2	6M

UNIT-III

5		A cylinder body of 300 mm diameter and 1.6 m height is maintained at a constant temperature of 36.5 ^{0}C. The surrounding temperature is 13.5 ^{0}C. Find out the amount of heat to be generated by the body per hour if ρ = 1.025 kg/m^3,ν = 15.06 x 10^{-6} m^2/s, cp = 0.96 kJ/kg^{0}C and k = 0.0892 kJ/mh ^{0}C and β=1/298 K-1. Assume Nu=0.12(Gr.Pr)$^{1/3}$.	L4	12M

OR

6		Calculate the heat transfer from a 60 W in candescent bulb at 115 ^{0}C to ambient air at 25 ^{0}C. Assuming the bulb as a sphere of 50 mm diameter. Also, find the percentage of power lost by free convection. The correlation is given by: Nu = 0.60 (Gr.Pr)$^{1/4}$ .Take k=2.964 x10^{-2} W/m ^{0}C, υ = 20.02x10-6 m^2/s, Pr = 0.694.	L4	12M

UNIT-IV

7	a	Explain the concept of black body.	L1	6M
	b	Explain the surface emissive properties.	L1	6M

OR

8	a	Distinguish between Boiling and Condensation.	L1	6M
	b	What is black body? How is differ from a gray body?	L1	6M

UNIT-V

9	In a certain double pipe heat exchanger hot water flow at a rate of 5000 kg/h and gas cooled from 95 ^{0}C to 65 ^{0}C. At the same time 50000 kg/h of cooling water at 30 ^{0}C enters the heat exchanger. The flow conditions are that L4overall heat transfer coefficient remains constant at 2270 W/m^2 K. Determine the heat transfer area required and the effectiveness, assuming two streams are in parallel flow. Assume for the both the streams cp = 4.2 kJ/kg K.	L4	12M
	OR		
10	The flow rate of hot and cold water streams running through a parallel flow heat exchanger are 0.2 kg/s and 0.5 kg/s respectively. The inlet temperatures on the hot and cold sides are 75 ^{0}C and 20 ^{0}C respectively. The exit temperature of hot water is 45^{0}C. If the individual heat transfer coefficients on the both sides are 650 W/m^2 ^{0}C, calculate the area of heat exchanger	L4	12M

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