Q.P. Code: 18ME0320 **R18**

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year II Semester Regular Examinations July-2021

HEAT & MASS TRANSFER

(Common to ME & AGE)

Time: 3 hours Max. Marks: 60

PART-A

(Answer all the Questions **5 x 2 = 10** Marks)

1	a	What is Fourier's law?	L1	2M
	b	What is lumped heat analysis?	L1	2M
	c	What is meant by laminar flow and turbulent flow?	L1	2M
	d	Define Boiling and Condensation.	L1	2M
	e	Define Radiation.	L1	2M

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

2	a	Distinguish between conduction,convenction and radiation modes in heat transfer	L3	5M
	b	Calculate the rate of heat transfer per unit area through a copper plate 45 mm thick, whose one face is maintained at 350 ^{0}C and the other face at 50 ^{0}C. Take thermal conductivity of copper as 370 W/m ^{0}C.	L4	5M

OR

3	a	Derive the general heat conduction equation in Cartesian coordinate	L3	5M
	b	Derive the general heat conduction equation in Spherical coordinate.	L3	5M

UNIT-II

4	a	Derive the expression for the overall heat transfer coefficient for a composite wall.	L3	5M
	b	A steel ingot (large in size) heated uniformly to 745 ^{0}C is hardened by quenching it in an oil bath maintained at 20 ^{0}C. Determine the length of time required for the temperature to reach 595 ^{0}C at a depth of 12 mm. The ingot may be approximated as a flat plate. For steel ingot take α(thermal diffusivity) = 1.2x10^{-5} m^2/s.	L4	5M

OR

5	a	Derive an expression for heat conduction through a plane wall.	L1	5M
	b	Explain the fin effectiveness and fin efficiency.	L2	5M

UNIT-III

6	a	Differentiate between laminar and Turbulent flow.	L3	5M
	b	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	5M

OR

7	A horizontal plate measuring 1.5 m x 1.1 m and at 215 ^{0}C, taking upward is placed in still air at 25 ^{0}C. Calculate the heat loss by natural convection. The convective film coefficient for free convection is given by the following empirical relation h = 3.05$(T_f)^{1/4}$ W/m2 0C. where T_f is the mean film temperature in degree Kelvin.	**L4**	**10M**

UNIT-IV

8	Derive the expression for Logarithmic Mean Temperature Difference (LMTD) in case of counter flow.	**L3**	**10M**

OR

9	**a**	What are the applications of boiling and condensation process?	**L1**	**5M**
	b	Differentiate between the mechanism of film wise and drop wise condensation.	**L3**	**5M**

UNIT-V

10	Explain the surface emissive properties	**L2**	**10M**

OR

11	Define Fick's law. Explain briefly.	**L1**	**10M**

END