O.P.Code: 20ME0315 | R20 | H.T.No.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech II Year I Semester Regular & Supplementary Examinations December-2023
HEAT & MASS TRANSFER
(Agricultural 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.	CO1	L1	6M
	b	Name and explain the mechanism of heat transfer.	CO1	L1	6M
		OR			
2	a	What is conduction heat transfer? Explain its parameters	CO1	L1	6M
	b	A plane wall is 150 mm thick and its wall area is 4.5 m^2. If its conductivity is 9.35 W/m °C and surface temperature are steady at 150 °C and 45 °C, determine i).Heat transfer across the plane wall, ii).Temperature gradient in the flow direction.	CO1	L4	6M

UNIT-II

3	a	Derive an expression for heat conduction through a composite wall.	CO2	L3	6M
	b	A reactor's wall, 320 mm thick, is made up of an inner layer of fire brick (k = 0.84W/m °C) covered with a layer of insulation (k = 0.16 W/m °C). The reactor operates at a temperature of 1325 °C and the ambient temperature is 25°C. Determine the thickness of fire brick and insulation which gives minimum heat loss.	CO2	L4	6M
		OR			
4	a	What is lumped system analysis? Derive the expression for it	CO2	L3	6M
	b	A 50 cm x 50 cm copper slab 6.25 mm thick has a uniform temperature of 300 °C. Its temperature is suddenly lowered to 36 °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 °C, k = 370 W/m °C and h = 90 W/m^2 °C.	CO2	L4	6M

UNIT-III

5	a	What is the physical significance of the Nusselt number? How is it defined.	CO3	L3	6M
	b	Assuming that a man can be represented by a cylinder 350 mm in diameter and 1.65 m high with a surface temperature of 28 °C. Calculate the heat he would lose while standing in a 30 km/h wind at 12 °C.	CO3	L4	6M
		OR			
6	a	Differentiate between laminar and Turbulent flow.	CO3	L3	6M
	b	A horizontal plate measuring 1.5 m x 1.1 m and at 215 °C, taking upward is placed in still air at 25 °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(Tf)1/4 W/m2 °C. where Tf is the mean film temperature in degree Kelvin.	CO3	L4	6M

UNIT-IV

7	a	What are the applications of boiling and condensation process?	CO4	L1	6M
	b	Explain Stefan Boltzmann Law, Kirchhoff's Law.	CO4	L1	6M

OR

8	**a**	Distinguish between Boiling and Condensation.	**CO4**	**L1**	**6M**
	b	What is black body? How is differ from a gray body?	**CO4**	**L1**	**6M**

UNIT-V

9		Derive the expression for Logarithmic Mean Temperature Difference (LMTD) in case of counter flow.	**CO5**	**L3**	**12M**

OR

10		In a certain double pipe heat exchanger hot water flow at a rate of 5000 kg/h and gas cooled from 95 °C to 65 °C. At the same time 50000 kg/h of cooling water at 30 °C enters the heat exchanger. The flow conditions are that L4overall heat transfer coefficient remains constant at 2270 W/m2 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 .	**CO5**	**L4**	**12M**

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