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

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year I Semester Supplementary Examinations July-2022

HEAT & MASS TRANSFER

(Agricultural Engineering)

Time: 3 hours Max. Marks: 60

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

UNIT-I

1	**a**	Define the following terms. i)Heat ii) Heat transfer	**L1**	**6M**
	b	Enumerate the some important areas which are covered under the discipline of heat transfer.	**L1**	**6M**

OR

2		Derive the general heat conduction equation in Cylindrical coordinate	**L3**	**12M**

UNIT-II

3		The inner surface of a plane wall is at 60°C and the over surface is at 35°C . Calculate the rate of heat transfer per m2 of surface area of the wall, which is 220 mm thick. Take thermal conductivity of the brick is 0.51 W/ m°C.	**L2**	**12M**

OR

4	**a**	Write short note on transient heat conduction.	**L1**	**6M**
	b	A steel ingot (large in size) heated uniformly to 745°C is hardened by quenching it in an oil bath maintained at 20°C. Determine the length of time required for the temperature to reach 595°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**	**6M**

UNIT-III

5	**a**	What is convective heat transfer? Distinguish between free and forced convection.	**L1**	**6M**
	b	Derive the expression for Reynolds number and how flows are determined by Reynolds number.	**L3**	**6M**

OR

6		In a straight tube of 60 mm diameter, water is flowing at a velocity of 12 m/s. The tube surface temperature is maintained at 70°C and the following water is heated from the inlet temperature 15°C to an outlet temperature of 45°C. taking the physical properties of water at its mean bulk temperature, Calculate the following: i. The heat transfer coefficient from the tube surface to the water ii. The heat transferred iii. The length of the tube	**L4**	**12M**

UNIT-IV

7		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°C and 20°C respectively. The exit temperature of hot water is 45°C. If the individual heat transfer coefficients on the both sides are 650 W/m^2°C, calculate the area of heat exchanger.	**L4**	**12M**

OR

8	**a**	Distinguish between Boiling and Condensation.	**L3**	**6M**
	b	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 overall 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**	**6M**

UNIT-V

9	**a**	Explain the modes of Mass transfer	**L1**	**6M**
	b	Define Fick's law. Explain briefly	**L1**	**6M**

OR

10		Calculate the following for an industrial furnace in the form of black body and emitting radiation at 2500 °C. i. Monochromatic emissive power at 1.2 μm length ii. Wave length at which the emission is maximum iii. Maximum emissive power iv. Total emissive power v. Total emissive power of the furnace if the assumed as a real surface with emissivity equal to 0.9.	**L4**	**12M**

*** END ***