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

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year I Semester Regular Examinations December-2021

HEAT & MASS TRANSFER

(Agricultural Engineering)

Time: 3 hours Max. Marks: 60

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

UNIT-I

1	a	What is Fourier's law of conduction? State the assumption and essential feature of it	L1	6M
	b	Define the following terms. i) Thermal Conductivity ii) Thermal Resistance	L1	6M
		OR		
2	a	Write the laws of radiation? Explain its parameters.	L1	6M
	b	A surface having an area of 1.5 m2 and maintained at 300°C exchanges heat by radiation with another surface at 40°C . The value factor due to the geometric location and emissivity is 0.52. Determine: i) Heat loss by radiation ii) The value of thermal resistance iii) The value of equivalent convection coefficient	L4	6M

UNIT-II

3		An exterior wall of a house may be approximated by a 0.1 m layer of common brick(K=0.7 w/m°C) followed by a 0.04 m layer of gypsum plaster(K=0.48 w/m°C).What thickness of loosely packed rock wool insulation(K=0.065 w/m°C) should be added to reduce the heat loss trough the wall by 80 percent.	L4	12M
		OR		
4	a	Sketch various types of fins. Give examples of use of fins in various engineering applications.	L2	6M
	b	A longitudinal copper fin (k = 380 W/m°C) 600 mm long and 5 mm diameter is exposed to air stream at 20°C. The convective heat transfer coefficient is 20 W/ m^2 °C. If the fin base temperature is 150°C, determine i. The heat transferred, and ii. The efficiency of the fin	L4	6M

UNIT-III

5		Explain hydrodynamic and thermal boundary layer with reference to flow over flat plate.	L1	12M
		OR		
6	a	Differentiate between laminar and Turbulent flow.	L3	4M
	b	A vertical cylinder 1.5m high and 180mm in diameter is maintained at 100°C in an atmosphere environment of 20°C. Calculate heat loss by free convection from the surface of the cylinder. Assume properties of air at mean temperature as ρ =1.06 kg/m^3,v 18.97 x 10^{-6} m^2/s,cp=1.004 kJ/kg°C and k=0.1042kJ/mh°C.	L4	8M

UNIT-IV

7		Saturated steam at tsat = 90°C (P= 70.14 kPa) condenses on the outer surface of a 1.5 m long 2.5m OD vertical tube maintained at a uniform temperature t_∞=70°C. Assuming film condensation. Calculate i) The local transfer coefficient at the bottom of the tube, and ii) The average heat transfer coefficient over the entire length of the tube. Properties of water of 80°C,ρ_l =974 kg/m3, kt = 0.668 W/mK, μl =.335x10^3kg/m^3, hfg = 2309 kJ/kg, $\rho v << \rho l$	L4	12M

OR

8	a	Differentiate between the mechanism of film wise and drop wise condensation	L3	6M
	b	A vertical tube of 60 mm outside diameter and 1.2 m long is exposed to steam at atmospheric pressure. The outer surface of the tube is maintained at a temperature of 50°C by circulated cold water through the tube. Calculate the following i). The rate of heat transfer to the coolant, and ii). The rate of condensation of steam	L4	6M

UNIT-V

9		The effective temperature of the body having an area of 0.12 m2 is 527°C. Calculate the following i) The total rate of energy emission ii) The wave length of maximum monochromatic emissive power	L4	12M

OR

10	a	Define the term absorptivity, reflectivity and transmittivity of radiation.	L1	6M
	b	Explain Plank"s Law, Wiens Displacement Law.	L2	6M

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