Q.P. Code: 16ME320 **R16**

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

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

HEAT TRANSFER

(Mechanical 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		4M
	b	List the some important areas which are covered under the discipline of heat transfer.		8M
		OR		
2	a	What is Fourier's law of conduction? State the assumption and essential feature of it.		6M
	b	Define the following terms. i) Thermal Conductivity ii) Thermal Resistance		6M

UNIT-II

3	a	Derive an expression for heat conduction through a plane wall	6M
	b	The inner surface of a plane Brick wall is at 60 ^{0}C and the outer surface is at 5M 35 ^{0}C. Calculate the rate of heat transfer per m^2 of surface area of the wall, which is 220 mm thick. Take thermal conductivity of the brick is 0.51 W/ m^{0}C.	6M
		OR	
4		A steam pipe of outside diameter 80 mm and 25 m long conveys 800 kg of steam per hour at a pressure of 22 bar. The steam enters the pipe with a dryness fraction of 0.99 and is to leave the other end of the pipe with the minimum dryness fraction of 0.97. This is to be accomplished by using a lagging material (k = 0.2 W/m ^{0}C), determine its minimum thickness to meet the necessary condition, if the temperature of the outside surface of lagging is 25 ^{0}C. Assume that there is no pressure drop across the pipe and the resistance of the pipe material is negligible.	12M

UNIT-III

5		Explain hydrodynamic and thermal boundary layer with reference to flow over flat plate.	12M
		OR	
6		Air at 20 ^{0}C and at a pressure of 1 bar is flowing over a flat plate at a Velocity of 3 m/s. If the plate is 280 mm wide and at 56 ^{0}C. Calculate the following quantities at x = 280 mm, given that properties of air at the bulk mean temperature $(\frac{20+56}{2}) = 38\ ^0C$ are ρ = 1.1374 kg/m^3, k = 0.02732 W/m ^{0}C, c_p = 1.005 kJ/kg K, υ = 16.76x10^{-6} m^2/s, Pr = 0.7	12M

i. Boundary layer thickness
ii. Local friction coefficient
iii. Average friction coefficient
iv. Thickness of the boundary layer

UNIT-IV

7 **a** Differentiate between the mechanism of film wise and dropwise Condensation. **6M**

b Explain briefly the condensation mechanism on the vertical plate **6M**

OR

8 Saturated steam at $t_{sat} = 90\ ^0C$ (P= 70.14 kPa) condenses on the outer surface of a 1.5 m long 2.5 m OD vertical tube maintained at a uniform temperature $t_\infty = 70\ ^0C$. Assuming film condensation. Calculate

i). The local transfer coefficient at the bottom of the tube, and **12M**

ii). The average heat transfer coefficient over the entire length of the tube. Properties of water of 80 ^0C, $\rho_l = 974\ kg/m^3$, $k_t = 0.668\ W/mK$, $\mu_l = 0.335 \times 10^3\ kg/m^3$, $h_{fg} = 2309\ kJ/kg$, $\rho_v << \rho_l$

UNIT-V

9 **a** Define Radiation heat transfer. **4M**

b Define the term absorptivity, reflectivity and transmittivity of radiation. **8M**

OR

10 The effective temperature of the body having an area of 0.12 m^2 is 527 ^oC. Calculate the following **12M**

i) The total rate of energy emission

ii) The wave length of maximum monochromatic emissive power.

*** END ***