Q.P. Code: 16ME343 **R16**

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech III Year II Semester Regular & Supplementary Examinations October-2020

HEAT AND MASS TRANSFER

(Agricultural Engineering)

Time: 3 hours Max. Marks: 60

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

UNIT-I

1	**a**	Various modes of heat transfer-Explain.	**7M**
	b	What are the assumptions that are made in Fourier's law?	**5M**

OR

2		Derive the expression for general heat conduction equation in Cartesian coordinates.	**12M**

UNIT-II

3	**a**	What is Semi-infinite body?	**6M**
	b	Derive an expression for heat conduction through a composite wall.	**6M**

OR

4		A rector's wall, 320 mm thick, is made up of an inner layer of fire brick (k=0.84 W/m ^{o}C) covered with a layer of insulation (k=0.16 W/m ^{o} C).The reactor operates at a temperature of 1325^{o} C and the ambient temperature of 25^{o} C. Find the thickness of fire brick and insulation which gives minimum heat loss.	**12M**

UNIT-III

5	**a**	What is Newton's law of viscosity?	**6M**
	b	Define Grash of number. Explain its significance in convection heat transfer.	**6M**

OR

6		A vertical cylinder 1.5 m high and 180 mm in diameter is maintained at 100^{o} C in an atmospheric environment of 20^{o} C. Calculate the 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= 18.97x10^{-6} m^{2} / s, K = 0.10421 W/m ^{o} C, Cp = 1.004 kJ / kg ^{o} C.	**12M**

UNIT-IV

7	**a**	State the merits and demerits of NTU method over LMTD method.	**6M**
	b	A wire of 1.2 mm diameter and 200 mm length is submerged horizontally in water at 7.0 bar. The wire carries a current of 135.0 A with an applied voltage of 2.18 V. If the surface of the wire is maintained at 200 ^{o} C, Calculate the following: (i) Heat flux (ii) The boiling heat transfer coefficient.	**6M**

OR

8		Derive an expression for logarithmic mean temperature difference in case of parallel flow heat exchanger.	**12M**

UNIT-V

9		A distillation column containing a mixture of benzene and toluene is at a temperature of 105 ^{o} C and a pressure of 1 bar. The liquid and vapour phases contain 20% mole of benzene and 55 % mole of toluene. At 105 ^{o} C the vapour pressure of toluene is 0.72 bar and its diffusivity is 5.2X 10^{-6} m^{2}/s. Assuming the equimolar diffusion, calculate the molar diffusion flux of toluene if the diffusion zone is 0.35 m thick.	**12M**

OR

10	**a**	Distinguish between a black body and grey body.	**6M**
	b	A gray surface is maintained at a temperature of 727 ^{o} C. If the maximum spectral emissive power at that temperature is 1.37 X 10 ^{10} W/m^{3}.determine the emissivity of the body and the wavelength corresponding to the maximum spectral intensity of radiation.	**6M**

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