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

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

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

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**	What is Fourier's law of conduction?	**6M**
	b	Define thermal conductivity and explain the various factors.	**6M**

OR

2		Plane wall is 150 mm thick and its wall area is 4.50 m^2 .Its conductivity is 9.35 W/m^o C and surface temperatures are 150°C and 45° C. Determine the following (i). Heat flow across the plane wall (ii). Temperature gradient in the flow direction.	**12M**

UNIT-II

3	**a**	What are Biot and Fourier numbers? Explain their physical significance.	**6M**
	b	Sketch various types of fins and give examples for them in engineering applications.	**6M**

OR

4		Steel rod (k=32 W/m ° C) of 12 mm diameter and 60 mm long with an insulated end is to be used as a spine. It is exposed to surroundings with a temperature of 60° C and a heat transfer coefficient of 55 W/m^2 ° C. The temperature at the base of fin is 95° C. Determine the following: (i) Fin efficiency (ii) Temperature at the end of the spine (iii) Heat dissipation.	**12M**

UNIT-III

5	**a**	What is convective heat transfer?	**6M**
	b	What is the difference between laminar flow and turbulent flow?	**6M**

OR

6		Air at atmospheric pressure and 40 ° C flows with a velocity of U = 5 m/s over a 2 m long flat plate whose surface is kept at a uniform temperature of 120 ° C .Determine the average heat transfer coefficient over the 2 m length of the plate. Also find out the rate of heat transfer between the plate and the air per 1 m width of the plate. [Air at 1 atm.& 80° C, $\nu = 2.107 \times 10^{-5}$ m^2 / s, K = 0.03025 W/m K, Pr = 0.6965].	**12M**

UNIT-IV

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

OR

8	**a**	Enumerate the applications of boiling heat transfer.	**6M**
	b	In a parallel flow double-pipe heat exchanger water flows through the inner pipe and is heated from 20° C to 70 ° C. Oil flowing through the annulus is cooled from 200 ° C to 100 ° C. It is desired to cool the oil to a lower exit temperature by increasing the length of the heat exchanger. Determine the minimum temperature to which the oil may be cooled.	**6M**

UNIT-V

9 State and explain the following laws of radiation: 12M
i. Kirchoffs law of radiation.
ii. Stefan - Boltzmann law.
iii. Wien's Displacement law.

OR

10 a Write the applications of mass transfer. 6M

b Determine the rate of radiation heat loss from a steel tube of outer diameter 70 mm and 4 mm long at a temperature of 227 ^{o} C if the tube is located within a square brick conduit of 0.3 m side and at a temperature of 27 ^{o} C. Take emissivities ε of steel and brick as 0.7 & 0.9 respectively. 6M

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