Q.P. Code:	16ME343
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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

6M

6M

Answer	all	Five	Units	5	X	12	=	60	Marks)	
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11	INT	TI
IU.	TAT	1-1

- 1 a What is Fourier's law of conduction?6Mb Define thermal conductivity and explain the various factors.6MOR0R
- 2 Plane wall is 150 mm thick and its wall area is 4.50 m². Its conductivity is 9.35 W/m° C and surface temperatures are 150°C and 45° C. Determine the following (i).
 12M Heat flow across the plane wall (ii). Temperature gradient in the flow direction.

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
- 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/m² ° C. The temperature at the base of fin is 95° C.
 12M Determine the following: (i) Fin efficiency (ii) Temperature at the end of the spine (iii) Heat dissipation.

UNIT-III

5 a What is convective heat transfer?

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, $v = 2.107 \times 10^{-5} \text{ m}^2 / \text{ s}$, K = 0.03025 W/m K, Pr = 0.6965].

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.
 - 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.

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State and explain the following laws of radiation:

Write the applications of mass transfer.

steel and brick as 0.7 & 0.9 respectively.

i. Kirchoffs law of radiation.

ii. Stefan - Boltzmann law.iii. Wien's Displacement law.

9

10 a

mina

*** END ***

UNIT-V

OR

brick conduit of 0.3 m side and at a temperature of 27 °C. Take emissivities ε of

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 ° C if the tube is located within a square

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- is to be used as a spine. It is exposed to surroundings with a temperature of 60° C and a heat available andfinient of 55 W/m² C. The temperature at the base of fm is 95° C. (226 Determine the following: (4) Fin efficiency (6) (femperature at the weat of the spine (60) Heat dissipation

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When is convective heat transfery

12M

6M

6M

What is the difference (increase familiar flow and turbulent ito)

Air as autospite r_{c} encisions and 30° C flows with it volocity of U = 5 m/s over a = 2 m long fluct plate whose method r_{c} kept at a uniform temperature of 120 °C. Determine the accretion best marker coefficient over the 2 m length of the plate. Also find out the rate of non-transfer between the plate and the air por 1 m with a of the plate. [Air m 1 and β 80° C, v = 2.10° x 10 ° m/ s, K = 0.03005 W/m K. Fr = 0.9805]

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