





# SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)  
Approved by AICTE, New Delhi, affiliated to Anna University, Chennai  
Accredited by NQA, CoE with 'A++' Grade (Cycle III) &  
Accredited by NQA, CoE with 'A++' Grade (Cycle IV)  
COIMBATORE-641 035, TAMIL NADU



**B**

R/E/B.Tech.- Internal Assessment - III  
Academic Year 2024-2025 (EVEN Semester)

Mechanical Engineering  
19MEB302-HEAT & MASS TRANSFER  
(Usage of standard Heat & Mass transfer Data book and steam tables are permitted)

Time: 1<sup>1/2</sup> Hours

Maximum Marks: 50

Answer All Questions  
PART - A (2\*5=10 Marks)

1. Brief Radiative heat transfer. CO Blooms
2. Define Shape Factor or View factor CO4 UND
3. A surface at 900 K has an emissivity of 0.85. Calculate its total emissive power. CO4 UND
4. Write the formula for mass concentration of a substance in a mixture. CO4 APP
5. The diffusion coefficient for carbon dioxide in air at 298 K and 1 atm is  $1.6 \times 10^{-5} \text{ m}^2/\text{s}$ . Calculate the mass flux for a concentration gradient of  $3 \text{ kg/m}^4$ . CO5 REM

PART - B (2\*13=26 Marks) & (1\*14=14 Marks)

6. Two infinite parallel plates at temperatures of 1000 K and 600 K exchange radiation directly. The emissivities are 0.9 and 0.6 respectively. Determine the net radiation heat transfer rate per unit area. Also explain the impact of adding a radiation shield with emissivity 0.1 between them. CO Blooms
7. 800 W/m<sup>2</sup> of radiant energy is incident upon a surface, out of which 300 W/m<sup>2</sup> is absorbed, 100 W/m<sup>2</sup> is reflected and the remainder is transmitted through the surface. Calculate absorptivity, reflectivity and transmissivity. CO4 ANA

(OR)

SNSCT2024GCTE141022

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7. (a) Helium diffusion through a plane membrane of 2mm thick. At the inner side concentration of helium is 0.025 kg. mole / m<sup>3</sup>, at outer side concentration of Helium is 0.007 kg. Mole / m<sup>3</sup>. What is the diffusion flux of helium through the membrane? Assume, diffusion coefficient of helium with respect to plane as  $1 \times 10^{-9} \text{ m}^2/\text{sec}$ . CO5 APP

(OR)

- (b) Give any two industrial case study and application of the mass transfer relating the heat transfer analysis. CO5 ANA
- (a) A grey body of area 0.02 m<sup>2</sup> and emissivity 0.75 is maintained at 1100 K and is exposed to surroundings at 300 K. Calculate the net radiative heat loss. Comment on how using a radiation shield affects the result. (GATE 2024) CO4 APP

(OR)

- (b) A chemical species diffuses through stagnant air over a flat plate of 1 m length. The flow is laminar and steady. Given:  $Re = 5 \times 10^3$ ,  $Sc = 0.6$ . Use the Chilton-Colburn analogy to estimate the mass transfer coefficient. Assume that the velocity of air is 3 m/s and kinematic viscosity is  $1.4 \times 10^{-5} \text{ m}^2/\text{s}$ . (GATE 2024) CO5 APP

Bloom's Taxonomy: REM - Remember, UND - Understand, APP - Apply, ANA - Analyze, EVA - Evaluate CRT - Create

Faculty in-charge

Teaching Coordinator

Head / Mech

(Dr. C. Sudhakar)

Dr. C. Sudhakar

Dr. C. Sudhakar





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COIMBATORE-641 035, TAMIL NADU



|                     |                                |
|---------------------|--------------------------------|
| Institution         | SNS College of Technology      |
| Branch              | Mechanical engineering         |
| Semester            | VI                             |
| Course Code/Name    | 19MEB302- Heat & Mass Transfer |
| Name of the Faculty | Dr. C. Senthil Kumar Asst/Prof |

## IA-3 Set B

| S.No | Quality Parameters based on blooms | Grade points (g) | Part | No of Questions(n) | Allotted marks (m) | n*m | Q= n*m*g |
|------|------------------------------------|------------------|------|--------------------|--------------------|-----|----------|
| 1    | Remember/ Understand (Level - 1,2) | 1                | A    | 03                 | 02                 | 06  | 06       |
|      |                                    |                  | B    |                    |                    |     |          |
|      |                                    |                  | C    |                    |                    |     |          |
| 2    | Apply (Level - 3)                  | 2                | A    | 02                 | 02                 | 04  | 08       |
|      |                                    |                  | B    | 02                 | 13                 | 26  | 52       |
|      |                                    |                  | C    | 02                 | 14                 | 28  | 56       |
| 3    | Analyze (Level - 4)                | 3                | A    |                    |                    |     |          |
|      |                                    |                  | B    | 02                 | 13                 | 26  | 78       |
|      |                                    |                  | C    |                    |                    |     |          |
| 4    | Evaluate (Level-5)                 | 4                | A    |                    |                    |     |          |
|      |                                    |                  | B    |                    |                    |     |          |
|      |                                    |                  | C    |                    |                    |     |          |
| 5    | Create (Level -6)                  | 5                | A    |                    |                    |     |          |
|      |                                    |                  | B    |                    |                    |     |          |
|      |                                    |                  | C    |                    |                    |     |          |

90 208

$$\text{Quality Index} = \frac{\sum Q}{\sum (nm)} = \frac{208}{90} = 2.3$$

2.8.26  
Faculty  
(Dr. C. Senthil Kumar)  
Asst/Prof

Teaching Coordinator  
V.B.

HoD/Mech  
21/5/24



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|---------------------|--------------------------------|
| Institution         | SNS College of Technology      |
| Branch              | Mechanical engineering         |
| Semester            | VI                             |
| Course Code/Name    | 19MEB302- Heat & Mass Transfer |
| Name of the Faculty | Dr. C. Senthil Kumar Asp/mah   |

## IA-3 Set A

| S.No | Quality Parameters based on blooms    | Grade points (g) | Part | No of Questions(n) | Allotted marks (m) | n*m | Q= n*m*g |
|------|---------------------------------------|------------------|------|--------------------|--------------------|-----|----------|
| 1    | Remember/<br>Understand (Level - 1,2) | 1                | A    | 03                 | 02                 | 06  | 06       |
|      |                                       |                  | B    |                    |                    |     |          |
|      |                                       |                  | C    |                    |                    |     |          |
| 2    | Apply (Level - 3)                     | 2                | A    | 02                 | 02                 | 04  | 08       |
|      |                                       |                  | B    | 02                 | 14                 | 28  | 56       |
|      |                                       |                  | C    |                    |                    |     |          |
| 3    | Analyze (Level - 4)                   | 3                | A    |                    |                    |     |          |
|      |                                       |                  | B    | 04                 | 13                 | 52  | 156      |
|      |                                       |                  | C    |                    |                    |     |          |
| 4    | Evaluate (Level-5)                    | 4                | A    |                    |                    |     |          |
|      |                                       |                  | B    |                    |                    |     |          |
|      |                                       |                  | C    |                    |                    |     |          |
| 5    | Create (Level -6)                     | 5                | A    |                    |                    |     |          |
|      |                                       |                  | B    |                    |                    |     |          |
|      |                                       |                  | C    |                    |                    |     |          |

$$\text{Quality Index} = \frac{\sum Q}{\sum (n \times m)} = \frac{226}{90} = 2.51$$

90    226

25/25  
Faculty

25/25  
Teaching Coordinator  
V.B.

25/25  
HoD / Mech