SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

DEPARTMENT OF MECHANICAL ENGINEERING

Course Code & Name: 19MEB302 – Heat & Mass Transfer **Semester: VI**

Class: III MECH B

Academic Year: 2024-2025 (Even Semester)

QUESTION BANK

UNIT – IV RADIATION
PART – A

1. Define Radiation heat transfer.
2. What is Stefan's Bolts Mann law?
3. What is Intensity of radiation?
4. Define Shape factor.
5. What is Radiation Shield?
6. Define Quantum theory.
7. Define Emissive power of a black surface.
8. Defme concept of Black body.
9. Define Planck's distribution law.
10. Define Wien's distribution law.

PART – B

01. Liquid Helium at 4.2 K is stored in a dewar flask of inner diameter = 0.48 m and outer diameter = 0.5 m. The dewar flask can be treated as a spherical vessel. The outer surface of the inner vessel and the inner surface of the outer vessel are well polished and the emissivity of these surfaces is 0.05. The space between the two vessels is thoroughly evacuated. The inner surface of the dewar flask is at 4.2 K while the outer surface is at 300 K. Estimate the rate of heat transfer between the surfaces.

02. A thin aluminium sheet with an emissivity of 0.1 on both sides is placed between two very
large parallel plates that are maintained at uniform temperatures Tl = 800 K and T2 = 500 K and have emissivities £"1 = 0.2 and £"2 = 0.7 respectively. Determine the net rate of radiation heat transfer between the two plates per unit surface area of the plates and compare the result to that without shield.

03.(i) Discuss how the radiation from gases differ from that of solids.

(ii) Two very large parallel plates with emissivity 0.5 exchange heat. Determine the percentage reduction in the heat transfer rate if a polished aluminium radiation shield of c = 0.04 is placed in between the plates.

04. (i) Define emissivity, absorptivity and reflectivity

(ii) Describe the phenomenon of radiation from real surfaces.

05. (i) What are the radiation view factors and why they are used?

(ii) Determine the view factor (F1-4) for the figure shown below.

06. (i) State and prove the following laws:
    (1) Kirchoffs law of radiation

    (2) Stefan - Boltzmann law

07. Explain briefly the following: (i) Specular and diffuse reflection

(ii) reflectivity and transmissivity

(iii) reciprocity rule and summation rule