MASTER OF SCIENCE (RENEWABLE ENERGY AND ENVIRONMENT) (MSCRWEE)

Term-End Examination

June, 2025

MRW-002 : HEAT TRANSFER

Time : 3 Hours　　　*Maximum Marks : 70*

Note : *Attempt any* **seven** *questions. All questions carry equal marks. Use of scientific calculator is permitted. Symbols have their usual meanings.*

1. (a) How does conduction occur in a composite wall with different materials put in (i) series and (ii) parallel ?　5

　(b) Define the following :　5

　　(i) Mole fraction

　　(ii) Dilution

(iii) Normality

(iv) Molality

(v) Molarity

2. Show that the temperature profile for heat conduction through a plane wall with a heat source and constant thermal conductivity is parabolic. 10

3. (a) What are the parameters to consider for evaluating the fin effectiveness ? Discuss their effect on performance of a fin. 5

    (b) State the features of Kirchhoff's law. 5

4. (a) Sketch the hydrodynamic thermal boundary layer for a laminar flow for a flow over a flat plate for (i) Pr = 1, (ii) Pr > 1, and (iii) Pr < 1. 5

    (b) Derive the momentum equation of a 2D incompressible flow. Explain the different terms of the final equations. 5

5. (a) What do you mean by film tempera-
ture ? State the average heat transfer
coefficient.   5

(b) Define eddy viscosity. How is it
different from kinematic viscosity ?   5

6. (a) What is a black body ? What are the
characterstics of a black body ?   5

(b) What is Stefan-Boltzmann's law ? What
is the importance of this law in heat
transfer ?   5

7. (a) What is the use of resistance analogy in
radiation heat transfer analysis ?
Discuss with suitable examples.   5

(b) With the help of a neat sketch, describe
jet condenser.   5

8. (a) How do you classify the heat
exchangers ? What is a counterflow
heat exchanger ?   5

(b) What is LMTD ? When do you use the
LMTD method ?   5

9. Write short notes on any *two* of following : 5+5

   (a) Critical thickness of insulation

   (b) Lump capacitance method

   (c) Shape factor

   (d) Fire Tube Boiler

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