

**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.*

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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 temperature ? 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 characteristics 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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