

MAHARASHTRA ANIMAL AND FISHERY SCIENCES UNIVERSITY, NAGPUR
SEMESTER END THEORY EXAMINATION, B.Tech.(DT)

Semester	: II (VI Dean)	Academic Year	: 2024-2025
Course No.	: DE-1204	Course Title	: Heat and Mass Transfer
Credits	: 2+1=3	Total Marks	: 40
Day & Date	: Tuesday; 12/08/2025	Time	: 2.00 hrs.

- Note :**
- 1) All questions from **Section 'A'** are compulsory.
 - 2) Solve **Any Five** questions from **Section 'B'**.
 - 3) Draw neat and well labeled diagram wherever necessary.

SECTION - 'A'

- Q. 1 Define the following terms. (05)
- i) Steady State
 - ii) Unsteady State
 - iii) Thermal Conductivity
 - iv) Grashoff Number
 - v) Fouling Factor
- Q. 2 State whether True or False. If false, rewrite the statement after making necessary corrections in the underlined word(s) only, if necessary. (05)
- i) In counter current flow heat exchanger, the logarithmic mean temperature difference between fluids is high flow as compared to parallel flow heat exchanger.
 - ii) Plate heat exchanger can be used at a high temperature.
 - iii) Fins are used to decrease the heat flow from the surface.
 - iv) Cork is a good insulator.
 - v) A body, which absorbs all the radiations falling on it, is called white body.
- Q. 3 Choose the most appropriate answer from the options given below. (05)
- i) Which property characterizes a material's ability to emit and absorb thermal radiation?
 - a) Emissivity
 - b) Absorptivity
 - c) Transmittivity
 - d) Conductivity
 - ii) The Logarithmic Mean Temperature Difference (LMTD) is used in the analysis of
 - a) Conduction heat transfer
 - b) Radiation heat transfer
 - c) Convection heat transfer
 - d) Heat exchangers
 - iii) Which type of heat exchanger design provides the highest possible heat transfer rate for a given surface area?
 - a) Parallel flow
 - b) Counter flow
 - c) Cross flow
 - d) Mixed flow
 - iv) Unit of overall heat transfer coefficient is
 - a) $W/m^2\ ^\circ C$
 - b) $W/m^\circ C$
 - c) $kW/m^\circ C$
 - d) Unitless
 - v) Specific heat of water is $kJ/kg\ ^\circ C$.
 - a) 3.9
 - b) 4.18
 - c) 1.0
 - d) 0.89

SECTION - 'B'

- Q. 4 Derive the Fourier's equation in Cartesian coordinates. (05)
- Q. 5 Explain the various modes of heat transfer. (05)
- Q. 6 A) Explain LMTD in parallel and counter flow with equation. (03)
B) Define critical radius of insulation. (02)
- Q. 7 A) State any two temperature measuring devices. (02)
B) What is insulation? Enlist the materials and explain any one. (03)
- Q. 8 A) State and explain Stefan Boltzman Law. (02)
B) What are the applications of Newton's Law of Cooling? (02)
C) Define Nusselt Number. (01)
- Q. 9 Explain Shell and Tube Heat Exchanger with neat sketch. (05)
- Q. 10 Explain mass transfer process. (05)
