

MAHARASHTRA ANIMAL AND FISHERY SCIENCES UNIVERSITY, NAGPUR
SEMESTER END THEORY EXAMINATION, B.Tech. (D.T.) Degree Course 2017-18

Semester	: II (V Dean)	Academic Year	: 2017-2018
Course No.	: DE-205	Course Title	: Heat and Mass Transfer
Credits	: 2+1=3	Total Marks	: 50
Day & Date	: Tuesday, 12.06.2018	Time	: 11.00 to 13.00 Hrs.

- Note :
- 1) All questions carry equal marks.
 - 2) **Section "A"** is Compulsory.
 - 3) Solve **Any Three** questions from **Section "B"**
 - 4) The use of scientific tables, charts and calculator is allowed in case of engineering courses.

SECTION – 'A'

- Q. 1 A) Give the formulae for the following. (05)
- i) Stefan-Boltzmann's law
 - ii) Fourier's law of heat conduction
 - iii) Thermal conductivity
 - iv) Logarithmic mean temperature difference
 - v) Efficiency of fin
- B) Give equations for following. (05)
- i) Reynold's number
 - ii) Nusselt number
 - iii) Prandtl number
 - iv) Grashoff number
 - v) Rayleigh number
- Q. 2 A) State whether True or False. If false, rewrite the statement after making necessary corrections. (05)
- i) Compared to parallel flow heat exchanger log mean temperature difference of counter flow heat exchanger will be more.
 - ii) Heat transfer from higher temperature to lower temperature takes place according to first law of thermodynamics.
 - iii) In turbulent flow maximum heat transfer rate can be expected.
 - iv) A material medium is always necessary for heat transmission.
 - v) The reflectance of a black body is Zero.
- B) Choose the most appropriate answer from the options given below. (05)
- i) The concept of overall coefficient of heat transfer is used in case of heat transfer by
 - a) Conduction
 - b) Convection
 - c) Radiation
 - d) Conduction and convection
 - ii) The process of heat transfer from one particle of the fluid to another by the actual movement of the fluid particles caused by some mechanical means, is known as
 - a) Conduction
 - b) Free convection
 - c) Force convection
 - d) Radiation

(P.T.O.)

- iii) Heat transfer takes place as per
- | | |
|-------------------------------------|-------------------------------|
| a) Zeroth law of thermodynamics | b) First law of thermodynamic |
| c) Second law of the thermodynamics | d) Kirchoff's law |
- iv) Log mean temperature difference in case of counter flow compared to parallel flow will be
- | | |
|---------|-----------------------------|
| a) Same | b) More |
| c) Less | d) Depends on other factors |
- v) The rate of heat flow through a body is $Q = [kA (T_1 - T_2)]/x$. The term x/kA is known as
- | | |
|------------------------|-----------------------|
| a) Thermal coefficient | b) Thermal resistance |
| c) Thermal conductance | d) None of these |

SECTION - 'B'

- Q. 3 A) What is mass transfer? Explain Fick's equation. (05)
 B) With a neat sketch, explain the working principle of a scraped surface heat exchanger. (05)
- Q. 4 A) What are extended surfaces? Write the equation for heat transfer through a rectangular fin. What is effectiveness and efficiency of fin? (05)
 B) Derive the equation for heat flow through composite cylinder having three layers. (05)
- Q. 5 A) Explain the concept to thermal equilibrium. (03)
 B) Give the classification of heat exchangers. (03)
 C) Explain the LMTD for parallel and counter flow with neat sketches. (04)
- Q. 6 A) The inner surface of a plane brick wall is at 50 degree C and the outer surface is at 25 degree C. Calculate the rate of heat transfer per square m of the surface area of the wall, which is 220 mm thick. The thermal conductivity of the bricks is 0.51 W/mK. (03)
 B) Hot air at a temperature of 145 degree C flows over a flat metal plate of area 2.5 m², maintained at 47 °C. If heat transfer coefficient is 74 W/m²C, calculate the amount of heat transferred into the plate. (03)
 C) Explain natural and forced convection heat transfer and give non-dimensional numbers used for computing these heat transfer processes. (04)
- Q. 7 Explain Plate Heat Exchanger with neat sketch in detail and its role in dairy industry. (10)
