18079

BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – B.Tech.(ME)-2021/B.Tech.(ME)-2023
Course Name – Heat Transfer
Course Code - PCC-ME501
(Semester V)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Select the anisotropic material from the following options

a) Wood
b) Concrete
c) Glass wool
d) Masonary brick

(ii) Choose the good conductor from the given option

a) carbon
b) mica
c) bakelite
d) fiber glass

(iii) Fourier law of heat conduction is identified as

a) Q = -k A d t /d x
b) Q = k A d x/d t
c) Q = -k A
d) Q = k d t/d x

(iv) Thermal conductivity is defined as the heat flow per unit time

a) When the temperature gradient is unity
b) Across the wall with no temperature
c) Through a unit thickness of the wall
d) Across unit area where the temperature gradient is unity

(v) Select heat transfer coefficient doesn't depend on

a) Orientation of solid surface
b) Time
c) Surface area
d) Space

(vi) select the correct option for that the heat energy propagation will be minimal.

a) copper
b) water
c) lead
d) air

(vii) Identify the wrong assumptions that are made for Fourier law.

a) No internal heat generation
b) Steady state heat conduction
c) Non- linear temperature profile
d) Isotropic and homogenous material

(viii) Select the heat conduction in gases is defined as

a) Elastic impact of molecules
b) Movement of electrons
c) EM Waves
d) Mixing of gases

(ix) Choose the false statement

a) For pure metal thermal conductivity is more
b) Thermal conductivity decreases with increase in the density of the substance
c) Thermal conductivity of dry material is lower than that of damp material
d) Heat treatment causes variation in thermal conductivity

(x) Select the Navier-Stokes equations are system of equations.

a) coupled
b) uncoupled
c) exponential
d) radical

(xi) Select the displacement thickness of a boundary layer is a measure of

a) The thickness of the laminar sublayer
b) The effective thickness of the boundary layer for flow resistance
c) The distance between the transition point and the separation point
d) The distance the boundary layer displaces the free-stream flow

(xii) Select the process of reducing the drag on an object by shaping it to reduce the size of the wake is defined as

a) Laminarization
b) Streamlining
c) Separation
d) Mixing

(xiii) Choose the LMTD (Log Mean Temperature Difference) method is commonly used to determine

a) The heat transfer coefficient of the exchanger
b) The outlet temperature of the hot fluid
c) The overall heat transfer rate in the exchanger
d) The pressure drop across the exchanger

(xiv) Select a parallel flow heat exchanger is identify to be perfectly counterflow when

a) The hot and cold fluids flow in opposite directions
b) The hot and cold fluids have the same flow rate
c) The outlet temperature of both fluids is the same
d) The heat transfer rate is maximum

(xv) Select in a parallel flow heat exchanger the directionm of travel of the hot fluid and cold fluid.

a) In the same direction
b) In opposite directions
c) Parallel to each other, but at different velocities
d) In a circular path

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Discuss about parallel flow heat exchangers. (3)
3. Discuss about NTU. (3)
4. Define emissive power. (3)
5. Define heat transfer. (3)

6. Explain the term Irradiation. (3)

OR

Explain the term radiosity. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. State the different modes of heat transfer and the law governing each of them with the equation for rate of heat transfer. (5)
8. Deduce the relationship between the effectiveness and the number of transfer units for a counter flow heat exchanger. (5)
9. Discuss about continuity equation. (5)

10. Deduce general heat conduction equation in Cartesian coordinates. (5)
11. Explain the term NTU and give its expression. (5)
12. Two large plates are maintained at a temperature of 900 K and 500 K respectively. Each plate has area of 6 m square. Compare the net heat exchange between the plates for both plates are black. (5)

OR

Water flows at the rate of 65 kg/min through a double pipe counter flow heat exchanger. Water is heated from 50 degree C to75 degree C by an oil flowing through the tube. The specific heat of the oil is 1.780 kj/kg.K. The oil enters at 115 degree C and leaves at 70 degree C.the overall heat transfer co-efficient is 340 W/m2K.calcualte the following: 1. Heat exchanger area 2. Rate of heat transfer (5)

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