PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Summer 2018 - 19 Examination

Semester: 6   Date: 09/05/2019
Subject Code: 03110355   Time: 10:30am to 1:00pm
Subject Name: Heat and Mass Transfer   Total Marks: 60

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (Each of one mark)   **(15)**

1. Which material has highest conductivity?
   a) Water   b) silver   c) copper   d) Steel

2. The body which has zero transmissivity is called as_____.
   a) White body   b) Black body   c) Opaque body   d) Gray body

3. When the thickness of insulation on a pipe exceeds the critical value, heat transfer rate _____.
   a) increase b) decrease   c) remains same   d) none of these

4. Heat transfer takes place according to_____law of thermodynamics.
    a) First law b) Second law c) Zeroth law d) none of these

5   Mode of heat transfer does not require any medium for transfer of heat is known as
    a) conduction   b) convection   c) radiation   d) none of this

6 .Insulating materials have _____thermal conductivity.(High or low)
7. Steady state means, property of system is_____(independent of time/vary with time)
8. In series connection, heat transfer rate through resistance is _____(constant or vary)
9. Equation for thermal conductive resistance of plane wall having wall thickness x is_____.
10.Define:Conduction
11. Define: Lambert cosine law.
12. Fin effectiveness is defined as ratio of actual heat transfer rate from fin surface to heat transfer rate without fin. True or False
13. Reflectivity of white body is zero. True or False
14. The SI unit of Stefan Boltzmann constant is _____.
15. With increase in temperature, thermal conductivity of metal increases. True or False

Q.2 Answer the following questions. (Attempt any three)   **(15)**

A) What is shape factor? Explain reciprocal and enclosure theorem.
B) Explain Fourier's law of heat conduction with all assumptions.
C) Define: Emissive power, Kirchhoff's law, Black body, Wien displacement law, Reflectivity
D) Explain Newton's law of cooling. What is convective thermal resistance?

Q.3 A) Derive equation of thermal conductive resistance for hollow cylinder.   **(07)**
B) Explain concept of electrical analogy of combined heat conduction and convection in a composite   **(08)**
plane wall and also Explain overall heat transfer coefficient.

OR

B) What is heat exchanger? Explain classification of heat exchanger with example.   **(08)**

Q.4 A) Explain heat exchange between two grey bodies. **(07)**

OR

A) A plane wall is 15 cm thick of surface area 4.5 m^2. Thermal conductivity of the wall is 9.5 w/mk. **(07)**
The inner and outer surface temperature of the wall is maintained at 150°c and 45°c respectively.
Determine:
   i)   Heat flow rate across the wall
   ii)   Temperature gradient in heat flow direction
   iii)   Temperature of surfaces at 5 cm & 10 cm away from inner surface.

B) What is critical radius of insulation? Derive an expression for critical radius of insulation in case **(08)**
of sphere.