Registration No :

Total Number of Pages : 02

M.Tech
HTPC102

1ˢᵗ Semester Back Examination 2019-20
ADVANCED HEAT TRANSFER - I
BRANCH : HEAT POWER & THERMAL ENGG, HEAT POWER ENGG, MECH. ENGG
(HEAT POWER ENGG), MECH. ENGG., THERMAL ENGG, THERMAL POWER ENGG
Time : 3 Hours
Max Marks : 70
Q.CODE : HB648
Answer Question No.1 which is compulsory and any FIVE from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**
  a) What do you understand by the term heat transfer through participating media?
  b) Define overall heat transfer coefficient.
  c) Why thermal conductivity of metals higher than that of fluids?
  d) Define thermal conductance and thermal resistance.
  e) State Lambert's cosine law.
  f) Differentiate between irradiation and radiosity.
  g) What do you mean by participating media? Give examples.
  h) What is lumped system?
  i) Ice and snow are considered as black body. Explain.
  j) What do you mean by a gray and a diffuse surface?

Q2 **a)** What is a radiation shield? Derive the expression for heat transfer through "n "number of shields between two plates. **(5)**
  b) A long cylindrical heater 25 mm in diameter is maintained at 700K and has surface emissivity of 0.6. The heater is located in a large room whose walls are at 300C. How much will the radiant transfer from the heater be reduced if it is surrounded by a 300 mm dia radiation shield of aluminum, having an emissivity of 0.2? What is the temperature of the shield? **(5)**

Q3 Define the following terms: (i) Total emissive power (E). (ii) Monochromatic emissive power ($E\lambda$) (iii) Emissivity. (iv) Intensity of radiation.. **(10)**
Give a short note on Solar radiation on earth's atmosphere.

Q4 **a)** Write a note on Planck's law of radiation. **(5)**
  b) Determine the rate of heat loss by radiation from a steel tube of outside diameter 70 mm and 3 m long at a temperature of 227ºC if the tube is located in a brick conduit of square cross-section of 0.3 m side. The conduit temperature is 27ºC. Take emmisivity for steel = 0.79 and for brick = 0.93. **(5)**

Q5 **a)** Write a short note on Radiant energy transfer through absorbing, emitting and scattering media **(5)**
  b) What is an error function? Explain its significance in a semi-infinite body in transient state. **(5)**

Q6 Explain any one method that you are familiar for solving two dimensional heat conduction problems. **(10)**

Q7 One end of a rectangular straight fin is fixed to a wall of uniform temperature **(10)** and the other end is insulated. The wall temperature is more than the surrounding atmospheric temperature. Derive an expression for temperature distribution and heat dissipation for the fin in standard form.

Q8 **Write short Notes on any TWO :** **(5 x 2)**
- **a)** Radiation from gases and vapours.
- **b)** Heat transfer from cylinder fins of a moving motorcycle.
- **c)** Heisler charts