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Question Paper Code: 56703

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Sixth Semester

Mechanical Engineering

15UME603 - HEAT AND MASS TRANSFER

(Regulation 2015)

(Approved Heat and Mass Transfer Data Book & Steam Tables are allowed)

Duration: 1.15 hrs

Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. The unit of overall coefficient of heat transfer is CO1- R
(a) W/m^2K (b) W/m^2 (c) W/mK (d) W/m
2. Heat is transferred by all three modes of transfer, viz. conduction, CO1- R
convection and radiation in
(a) Electric heater (b) Steam condenser (c) Boiler (d) Refrigerator condenser coils
3. $Nu = C Re^m Pr^n$ represents heat transfer under CO2- R
(a) Forced Convection (b) Free convection
(c) Combined convection (d) Conduction
4. The rate of energy transferred by convection to that by conduction is CO2- R
called
(a) Stanton number (b) Nusselt number (c) Biot number (d) Peclet number
5. By keeping constant area the heat transfer in counter flow heat CO3- R
exchanger is _____ than parallel flow heat exchanger.
(a) Higher (b) Lower (c) Same (d) None of these
6. The heat transfer rate of film wise condensation compared to drop wise CO3- R
condensation.
(a) Higher (b) Lower (c) Equal (d) Not able to predicted

7. The emissivity value of black body is equal to _____. CO4- R
 (a) 0 (b) 1 (c) Negative (d) None of the above
8. According to Stefan Boltzmann law, the total radiation from a black body per second per unit area is directly proportional to the CO4- R
 (a) Absolute temperature
 (b) Square of the absolute temperature
 (c) Cube of the absolute temperature
 (d) Fourth power of the absolute temperature
9. The mass flux is proportional to _____. CO5- R
 (a) Velocity gradient (b) Temperature gradient
 (c) Concentration gradient (d) Pressure gradient
10. The molecular weight of Naphthalene is _____. CO5- R
 (a) 74.08 (b) 128.16 (c) 28.02 (d) 157.02

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. A surface wall is made up of 3 layers one of fine brick, one of insulating brick and one of red brick. The inner and outer surface temperatures are 900°C and 30°C respectively. The respective thermal conductivity of the layers are 1.2, 0.14, and 0.9W/mK and the thickness of 20cm, 8 cm and 11 cm. Assuming close bonding of the layers at the interfaces. Find the heat loss per square meter and interface temperatures. CO1-Ana (8)
12. Water flows inside a tube of 20mm diameter and 3 m long at a velocity of 0.03m/s. The water gets heated from 40°C to 120° C while passing through the tube. The tube wall is maintained at constant temperature of 160° C. Find heat transfer. CO2-App (8)
13. An aluminum pan of 15 cm diameter is used to boil water and the water depth at the time of boiling is 2.5 cm. The pan is placed on an electric stove and the heating element raises the temperature of the pan to 110°C. Calculate the power input for boiling and the rate of evaporation. Take $C_{sf} = 0.0132$ CO3-App (8)
14. The sun emits maximum radiation at $\lambda=0.52\mu$. Assuming the sun to be a black body, calculate the surface temperature of the sun. also calculate the monochromatic emissive power of the sun's surface. CO4-U (8)

- 15 Air at 10°C with a velocity of 3m/s flows over a flat. plate. If the plate is 0.3m long, calculate the mass transfer coefficient. CO5-App (8)