103 TOP Heat Transfer - Mechanical Engineering Multiple Choice Questions and Answers List

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1. Unit of thermal conductivity in M.K.S. units is

(a) kcal/kg m2 °C

(b) kcal-m/hr m2 °C

(c) kcal/hr m2 °C

(d) kcal-m/hr °C

(e) kcal-m/m2 °C.

Ans: b

2. Unit of thermal conductivity in S.I. units is

(a) J/m2 sec

(b) J/m °K sec

(c) W/m °K

(d) (a) and (c) above

(e) (b) and (c) above.

Ans: e

3. Thermal conductivity of solid metals with rise in temperature normally

(a) increases

(b) decreases

(c) remains constant

(d) may increase or decrease depending on temperature

(e) unpredictable.

Ans: b

4. Thermal conductivity of non-metallic amorphous solids with decrease in temperature

(a) increases

(b) decreases

(c) remains constant

(d) may increase or decrease depending on temperature

(e) unpredictable.

Ans: b

5. 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 (e) Stefan's law.
Ans: c

6. When heat is transferred from one particle of hot body to another by actual motion of the heated particles, it is referred to as heat transfer by
(a) conduction
(b) convection
(c) radiation
(d) conduction and convection
(e) convection and radiation.
Ans: a

7. When heat is transferred form hot body to cold body, in a straight line, without affecting the intervening medium, it is referred as heat transfer by
(a) conduction
(b) convection
(c) radiation
(d) conduction and convection
(e) convection and radiation.
Ans: c

8. Sensible heat is the heat required to
(a) change vapour into liquid
(b) change liquid into vapour
(c) increase the temperature of a liquid of vapour
(d) convert water into steam and superheat it
(e) convert saturated steam into dry steam.
Ans: c

9. The insulation ability of an insulator with the presence of moisture would
(a) increase
(b) decrease
(c) remain unaffected
(d) may increase/decrease depending on temperature and thickness of insulation
(e) none of the above.
Ans: b

10. When heat is Transferred by molecular collision, it is referred to as heat transfer by

(a) conduction

(b) convection

(c) radiation

(d) scattering

(e) convection and radiation.

Ans: b

11. Heat transfer in liquid and gases takes place by

(a) conduction

(b) convection

(c) radiation

(d) conduction and convection

(e) convection and radiation.

Ans: b

12. Which of the following is the case of heat transfer by radiation

(a) blast furnace

(b) heating of building

(c) cooling of parts in furnace

(d) heat received by a person from fireplace

(e) all of the above.

Ans: d

13. Heat is closely related with

(a) liquids

(b) energy

(c) temperature

(d) entropy

(e) enthalpy.

Ans: c

14. Pick up the wrong case. Heat flowing from one side to other depends directly on

(a) face area

(b) time

(c) thickness

(d) temperature difference

(e) thermal conductivity.

Ans: c

15. Metals are good conductors of heat because
(a) their atoms collide frequently
(b) their atoms-are relatively far apart
(c) they contain free electrons
(d) they have high density
(e) all of the above.
Ans: a

16. Which of the following is a case of steady state heat transfer
(a) I.C. engine
(b) air preheaters
(c) heating of building in winter
(d) all of the above
(e) none of the above.
Ans: e

17. Total heat is the heat required to
(a) change vapour into liquid
(b) change liquid into vapour
(c) increase the temperature of a liquid or vapour
(d) convert water into steam and superheat it
(e) convert saturated steam into dry steam.
Ans: d

18. Cork is a good insulator because it has
(a) free electrons
(b) atoms colliding frequency
(c) low density
(d) porous body
(e) all of the above.
Ans: d

19. Thermal conductivity of water in general with rise in temperature
(a) increases
(b) decreases
(c) remains constant
(d) may increase or decrease depending on temperature

(e) none of the above.

Ans: d

20. Thermal conductivity of water at 20°C is of the order of

(a) 0.1

(b) 0.23

(c) 0.42

(d) 0.51

(e) 0.64.

Ans: d

21. Temperature of steam at around 540°C can be measured by

(a) thermometer

(b) radiatiouv pyrometer

(c) thermistor

(d) thermocouple

(e) thermopile.

Ans: d

22. Thermal conductivity of air at room temperature in kcal/m hr °C is of the order of

(a) 0.002

(b) 0.02

(c) 0.01

(d) 0.1

(e) 0.5.

Ans: b

23. The time constant of a thermocouple is

(a) the time taken to attain the final temperature to be measured

(b) the time taken to attain 50% of the value of initial temperature difference

(c) the time taken to attain 63.2% of the value of initial temperature difference

(d) determined by the time taken to reach 100°C from 0°C

(e) none of the above.

Ans: c

24. Thermal conductivity of air with rise in temperature

(a) increases

(b) decreases

(c) remains constant

(d) may increase or decrease depending on temperature

(e) none of the above.

Ans: a

25. Heat flows from one body to other when they have

(a) different heat contents

(b) different specific heat

(c) different atomic structure

(d) different temperatures

(e) none of the above.

Ans: d

26. The concept of overall coefficient of heat transfer is used in heat transfer problems of

(a) conduction

(b) convection

(c) radiation

(d) all the three combined

(e) conduction and comte_ction.

Ans: e

27. In heat transfer, conductance equals conductivity (kcal/hr/sqm/°C/cm) divided by

(a) hr (time)

(b) sqm (area)

(c) °C (temperature)

(d) cm (thickness)

(e) kcal (heat).

Ans: d

28. The amount of heat flow through a body by conduction is

(a) directly proportional to the surface area of the body

(b) directly proportional to the temperature difference on the two faces of the body

(c) dependent upon the material of the body

(d) inversely proportional to the thickness of the body

(e) all of the above.

Ans: e

29. Which of the following has least value of conductivity

(a) glass

(b) water

(c) plastic
(d) rubber
(e) air.
Ans: e

30. Which of the following is expected to have highest thermal conductivity
(a) steam
(b) solid ice
(c) melting ice
(d) water
(e) boiling water.
Ans: b

6-31. Thermal conductivity of glass-wool varies from sample to sample because of variation in
(a) composition
(b) density
(c) porosity
(d) structure
(e) all of the above.
Ans: e

32. Thermal conductivity of a material may be defined as the
(a) quantity of heat flowing in one second through one cm cube of material when opposite faces ^re maintained at a temperature difference of 1°C
(b) quantity of heat flowing in one second through a slab of the material of area one cm square, thickness 1 cm when its faces differ in temperature by 1°C
(c) heat conducted in unit time across unit area through unit thickness when a temperature difference of unity is maintained between opposite faces
(d) all of the above
(e) none of the above.
Ans: d

33. Which of the following has maximum value of thermal conductivity
(a) aluminium
(b) steel
(c) brass
(d) copper
(e) lead.
Ans: a

34. Moisture would find its way into insulation by vapour pressure unless it is prevented by

(a) high thickness of insulation

(b) high vapour pressure

(c) less thermal conductivity insulator

(d) a vapour seal

(e) all of the above.

Ans: d

35. Heat is transferred by all three modes of transfer, viz, conduction, convection and radiation in

(a) electric heater

(b) steam condenser

(c) melting of ice

(d) refrigerator condenser coils

(e) boiler.

Ans: e

36. According to Prevost theory of heat exchange

(a) it is impossible to transfer heat from low temperature source to t high temperature source

(b) heat transfer by radiation requires no medium

(c) all bodies above absolute zero emit radiation

(d) heat transfer in most of the cases takes place by combination of conduction, convection and radiation

(e) rate of heat transfer depends on thermal conductivity and temperature difference.

Ans: c

37. The ratio of heat flow Q1/Q2 from two walls of same thickness having their thermal conductivities as ATj - 2K2 will be

(a) l

(b) 0.5

(c) 2

(d) 0.25

(e) 4.0

Ans: c

38. Heat transfer by radiation mainly depends upon

(a) its temperature

(b) nature of the body

(c) kind and extent of its surface

(d) all of the above

(e) none of the above.
Ans: d

39. Thermal diffusivity is
(a) a dimensionless parameter
(b) function of temperature
(c) used as mathematical model
(d) a physical property of the material
(e) useful in case of heat transfer by radiation.
Ans: d

40. Thermal diffusivity of a substance is .
(a) proportional of thermal conductivity
(b) inversely proportional to k
(c) proportional to (k)
(d) inversely proportional to k2
(e) none of the above.
Ans: a

41. Unit of thermal diffusivity is
(a) m2/hr
(b) m2/hr°C
(c) kcal/m2 hr
(d) kcal/m.hr°C
(e) kcal/m2 hr°C.
Ans: a

43. Thermal conductivity of wood depends on
(a) moisture
(b) density
(c) temperature
(d) all of the above
(e) none of the above.
Ans: d

44. In convection heat transfer from hot flue gases to water tube, even though flow may be turbulent, a laminar flow region (boundary layer of film) exists close to the tube. The heat transfer through this film takes place by
(a) convection

(b) radiation
(c) conduction
(d) both convection and conduction
(e) none of the above.
Ans: c

45. Film coefficient is defined as Inside diameter of tube
(a) Equivalent thickness of film
(b) Thermal conductivity Equivalent thickness of film Specific heat x Viscocity
(c) Thermal conductivity Molecular diffusivity of momentum Thermal diffusivity
(d) Film coefficient x Inside diameter Thermalconductivity
(e) none of the above.
Ans: b

46. Heat conducted througfi unit area and unit thick face per unit time when temperature difference between opposite faces is unity,is called
(a) thermal resistance
(b) thermal coefficient
(c) temperature gradient
(d) thermal conductivity
(e) heat-transfer.
Ans: d

49. The rate of energy emission from unit surface area through unit solid angle, along a normal to the surface, is known as
(a) emissivity
(b) transmissivity
(c) reflectivity
(d) intensity of radiation
(e) absorptivity.
Ans: d

50. Emissivity of a white polished body in comparison to a black body is
(a) higher
(b) lower
(c) same
(d) depends upon the shape of body
(e) none of the above.
Ans: b

51. A grey body is one whose absorptivity
(a) varies with temperature
(b) varies with wavelength of the incident ray
(c) is equal to its emissivity
(d) does not vary with temperature and. wavelength of the incident ray
(e) none of the above.
Ans: c

53. Two balls of same material and finish have their diameters in the ratio of 2 : 1 and both are heated to same temperature and allowed to cool by radiation. Rate of cooling by big ball as compared to smaller one will be in the ratio of
(a) 1 :1
(b) 2: 1
(c) 1 : 2
(d) 4 : 1
(e) 1 : 4.
Ans: c

55. A non-dimensional number generally associated with natural convection heat transfer is
(a) Grashoff number
(b) Nusselt number
(c) Weber number
(d) Prandtl number
(e) Reynold number.
Ans: a

56. LMTD in case of counter flow heat exchanger as compared-to parallel flow heat exchanger is
(a) higher
(b) lower
(c) same
(d) depends on the area of heat exchanger
(e) depends on temperature conditions.
Ans: a

57. In heat exchangers, degree of approach is defined as the difference between temperatures of
(a) cold water inlet and outlet
(b) hot medium inlet and outlet
(c) hot medium outlet and cold water inlet

(d) hot medium outlet and cold water outlet
(e) none of the above.
Ans: d

58. In counter flow heat exchangers
(a) both the fluids at inlet (of heat ex¬changer where hot fluid enters) are in their coldest state
(b) both the fluids at inlet are in their hot¬test state
(c) both the fluids .at exit are in their hottest state
(d) one fluid is in hottest state and other in coldest state at inlet
(e) any combination is possible depending on design of heat exchanger.
Ans: b

59. A steam pipe is to be insulated by two insulating materials put over each other. For best results
(a) better insulation should be put over pipe and better one over it
(b) inferior insulation should be put over pipe and better one over it
(c) both may be put in any order
(d) whether to put inferior OIL over pipe or the better one would depend on steam temperature
(e) unpredictable.
Ans: a

61. Fourier's law of heat conduction is valid for
(a) one dimensional cases only
(b) two dimensional cases only
(c) three dimensional cases only
(d) regular surfaces having non-uniform temperature gradients
(e) irregular surfaces.
Ans: a

62. According of Kirchhoff's law,
(a) radiant heat is proportional to fourth power of absolute temperature
(b) emissive power depends on temperature
(c) emissive power and absorptivity are constant for all bodies
(d) ratio of emissive power to absorptive power is maximum for perfectly black body
(e) ratio of emissive power to absorptive power for all bodies is same and is equal to the emissive power of a perfectly black body.
Ans: e

63. All radiations in a black body are
(a) reflected

(b) refracted
(c) transmitted
(d) absorbed
(e) partly reflected and partly absorbed.
Ans: d

64. According to Kirchoff's law, the ratio of emissive power to absorptivity for all bodies is equal to the emissive power of a
(a) grey body
(b) brilliant white polished body
(c) red hot body
(d) black body
(e) none of the above.
Ans: d

65. 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
(e) convection and radiation.
Ans: d

66. The unit of overall coefficient of heat transfer is
(a) kcal/m2
(b) kcal/hr °C
(c) kcal/m2 hr °C
(4) kacl/m hr °C
(e) kcal/m3 hr °C.
Ans: c

68. Joule sec is the unit of
(a) universal gas constant
(b) kinematic viscosity
(c) thermal conductivity
(d) Planck's constant
(e) none of the above.
Ans: d

69. The value of Prandtl number for air is about

(a) 0.1

(b) 0.3

(c) 0.7

(d) 1.7

(e) 10.5.

Ans: c

70. The value of the wavelength for maximum emissive power is given by —

(a) Wien's law

(b) Planck's law

(c) Stefan's law

(d) Fourier's law

(e) Kirchhoff's law.

Ans: a

72. 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

(e) none of the above.

Ans: b

73. The energy distribution of an ideal reflector at higher temperatures is largely in the range of

(a) shorter wavelength

(b) longer wavelength

(c) remains same at all wavelengths

(d) wavelength has nothing to do with it

(e) none of the above.

Ans: a

74. Total emissivity of polished silver compared to black body is

(a) same

(b) higher

(c) more or less same

(d) very much lower

(e) very much higher.

Ans: d

75. According to Stefan-Boltzmann law, ideal radiators emit radiant energy at a rate proportional to

(a) absolute temperature

(b) square of temperature

(c) fourth power of absolute temperature

(d) fourth power of temperature

(e) cube of absolute temperature.

Ans: c

76. Which of the following property of air does not increase with rise in temperature

(a) thermal conductivity

(b) thermal diffusivity

(c) density

(d) dynamic viscosity

(e) kuiematic viscosity.

Ans: c

77. The unit of Stefan Boltzmann constant is

(a) watt/cm2 °K

(b) watt/cm4 °K

(c) watt2/cm °K4

(d) watt/cm2 °K4

(e) watt/cm2 °K2.

Ans: d

78. In free con-vection heat transfer, Nusselt number is function of

(a) Grashoff no. and Reynold no.

(b) Grashoff no. and Prandtl no.

(c) Prandtl no. and Reynold no.

(d) Grashoff no., Prandtl no. and Reynold no.

(e) none of the above.

Ans: b

79. Stefan Boltzmann law is applicable for heat transfer by

(a) conduction

(b) convection

(c) radiation

(d) conduction and radiation combined

(e) convection and radiation combined.

Ans: c

80. The thermal diffusivities for gases are generally
(a) more than those for liquids
(b) less than those for liquids
(c) more than those for solids
(d) dependent on the viscosity
(e) same as for the liquids.
Ans: a

81. The thermal diffusivities for solids are generally
(a) less than those for gases
(b) jess than those for liquids
(c) more than those for liquids and gases
(d) more or less same as for liquids and gases
(e) zerci.
Ans: c

83. Thermal diffusivity of a substance is
(a) directly proportional to thermal con¬ductivity
(b) inversely proportional to density of substance
(c) inversely proportional to specific heat
(d) all of the above
(e) none of the above.
Ans: d

85. The ratio of the emissive power and absorptive power of all bodies is the same and is equal to the emissive power of a perfectly black body. This statement is known as
(a) Krichoff's law
(b) Stefan's law
(c) Wien' law
(d) Planck's law
(e) Black body law.
Ans: a

86. According to Stefan's law, the total radiation from a black body per second per unit area is proportional to
(a) absolute temperature
(b) T2

(c) T5
(d) t
(e) l/T.
Ans: d

87. According to Wien's law, the wavelength corresponding to maximum energy is proportion to
(a) absolute temperature (T)
(b) l2
(c) f
(d) t
(e) 1/r.
Ans: a

88. Depending on the radiating properties, a body will be white when
(a) p = 0, x = 0 and a = 1
(b) p=l,T = 0anda = 0
(c) p = 0, x = 1 and a = 0
(d) x = 0, a + p = 1
(e) a = 0, x + p = 1.
where a = absorptivity, p = reflectivity, x = transmissivity
Ans: b

89. Depending on the radiating properties, a body will be black when
(a) p = 0, x = 0 and a = 1
(b) p= l,T = 0anda = 0
(c) p = 0, x = 1 and a = 0
(d) x = 0, a + p = 0
(e) a = 0,x + p= 1.
where a = absorptivity, p == reflectivity, X = transmissivity.
Ans: a

90. Depending on the radiating properties, a body will be opaque when
(a) p = 0, x = 0 and a = 1
(b) p=l,x = 0anda = 0
(c) p = 0, x = 1 and a = 0
(d) x - 0, a + p = 1
(e) a=0,x + p= 1.
where a = absorptivity, p = reflectivity, X = transmissivity.
Ans: d

91. The total emissivity power is .defined as the total amount of radiation emitted by a black body per unit
(a) temperature
(b) thickness
(c) area
(d) time
(e) area and time.
Ans: d

92. The ratio of the energy absorbed by the body to total energy falling on it is called
(a) absorptive power
(b) emissive power
(c) absorptivity
(d) emissivity
(e) none of the above.
Ans: a

93. 40% of incident radiant energy on the surface of a thermally transparent body is reflected back. If the transmissivity of the body be 0.15, then the emissivity of surface is
(a) 0.45
(b) 0.55
(c) 0.40
(d) 0.75
(e) 0.60.
Ans: a

94. The amount of radiation mainly depends on
(a) nature of body
(b) temperature of body
(c) type of surface of body
(d) all of the above
(e) none of the above.
Ans: d

95. The emissive power of a body depends upon its
(a) temperature
(b) wave length
(c) physical nature
(d) all of the above

(e) none of the above.

Ans: d

96. Two plates spaced 150 mm apart are maintained at 1000°C and 70°C. The heat transfer will take place mainly by

(a) convection

(b) free convection

(c) forced convection

(d) radiation

(e) radiation and convection.

Ans: d

97. Absorptivity of a body will be equal to its emissivity

(a) at all temperatures

(b) at one particular temperature

(c) when system is under thermal equi-librium

(d) at critical temperature

(e) for a polished body.

Ans: c

98. In regenerator type heat exchanger, heat transfer takes place by

(a) direct mixing of hot and cold fluids

(b) a complete separation between hot and cold fluids

(c) flow of hot and cold fluids alternately over a surface

(d) generation of heat again and again

(e) indirect transfer.

Ans: c

99. A perfect black body is one which

(a) is black in colour

(b) reflects all heat

(c) transmits all heat radiations

(d) abslprbs heat radiations of all wave lengths falling on it

(e) fully opaque.

Ans: d

100. Planck's law holds good for

(a) black bodies

(b) polished bodies

(c) all coloured bodies
(d) all of the above
(e) none of the above.
Ans: a

101. If the temperature of a solid surface changes form 27°C to 627°C, then its emissive power changes in the ratio of
(a) 3
(b) 6
(c) 9
(d) 27
(e) 81.
Ans: e

102. Depending on the radiating properties, body will be transparent when
(a) p = 0, x = 0 and a = 1
(b) p=l,x = 0,anda = 0
(c) p = 0, T= l,anda = 0
(d) X = 0, a + p = 1
(e) a = 0,x + p= 1.
Ans: c

103. A grey body is one whose absorptivity
(a) varies with temperature
(b) varies with the wave length of incident ray
(c) varies with both
(d) does not vary with temperature and wave length of the incident ray
(e) there is no such criterion.
Ans: d