3/2014

Maximum : 100 marks

Time : 1 hour and 15 minutes

1. For a viscous flow, the relation between the coefficient of friction f and Reynolds number Re is :

   (A) $f = 64/Re$ (B) $f = 16/Re$

   (C) $f = 8/Re$ (D) $f = 4/Re$

2. For flow through pipes, the maximum transmission efficiency that can achieve is :

   (A) 100% (B) 50%

   (C) 40% (D) 67%

3. The unit of Chezy's constant C in the Chezy's formula is :

   (A) None (B) m/s

   (C) m/s^2 (D) $m^{1/2}/s$

4. The ratio of the pitch diameter of Pelton wheel to the diameter of the jet is called :

   (A) Jet ratio (B) Speed ratio

   (C) Wheel ratio (D) None of the above

5. The hydraulic efficiency of a turbine with mean bucket diameter 1 m and running at 1000 rpm with net head 700 m when the side clearance angle is 15 degree and discharge of 100 liters/s is :

   (A) 60% (B) 70%

   (C) 85% (D) 97%

6. The specific speed of a Francis turbine which develops 7225 kW power under a head of 25 meters at 135 r.p.m is :

   (A) 150 (B) 180

   (C) 195 (D) 205

7. The head loss due to friction for the flow of water through penstocks can be minimized by :

   (A) Decreasing the diameter of penstock (B) Increasing the diameter of penstock

   (C) Increasing the length of penstock (D) Increasing the velocity of flow

8. The head against which the centrifugal pump has to work is called :

(A) Static head (B) Suction head

(C) Delivery head (D) Manometric head

9. An example of a turbine with high head and low specific speed is :

(A) Kaplan (B) Francis

(C) Pelton (D) None

10. The slip of a single acting reciprocating pump, running at 50 rpm, delivers 100 liters/s when the diameter of piston and stroke length are 200 mm and 400 mm respectively is :

(A) 0.47 m^3/sec (B) 0.047 m^3/sec

(C) 0.00047 m^3/s (D) 4.7 m^3/s

11. In the Van der Wall's equation $(p+(a/v^2))(v-b) = RT$ the unit of constant a is :

(A) Nm^2 (B) Nm^4

(C) N/m (D) None

12. Which parameter remains constant during Joule-Thomson expansion?

(A) Temperature (B) Pressure

(C) Enthalpy (D) Volume

13. For an ideal gas the compressibility factor is :

(A) Zero (B) Unity

(C) Infinity (D) None

14. A heat pump works on reversed Carnot cycle has a COP of 5. If it works as a refrigerator taking 1 kW of work input, the refrigerator effect will be :

(A) 1 kW (B) 2 kW

(C) 3 kW (D) 4 kW

15. The value of Universal gas constant is :

(A) 8.314 J/kgK (B) 83.14 kJ/kgK

(C) 8.314 kJ/kgK (D) None

16. Which one of the following is the extensive property of the system?

(A) Volume (B) Pressure

(C) Temperature (D) Density

17. Which parameter remains constant during a reversible adiabatic process?
(A) Enthalpy
(B) Temperature
(C) Entropy
(D) Internal Energy

18. Second law of thermodynamics defines :
(A) Efficiency
(B) Enthalpy
(C) Internal Energy
(D) Entropy

19. Which one of the following relation defines Helmholtz function F?
(A) H + TS
(B) H – TS
(C) U + TS
(D) U – TS

20. Which one of the following parameters is significant to ascertain chemical equilibrium of a system?
(A) Clapeyron Equation
(B) Maxwell reaction
(C) Helmholts Function
(D) Gibbs Function

21. Which of the following cast iron consists of carbon in rosette form?
(A) White cast iron
(B) Grey cast iron
(C) Malleable cast iron
(D) Nodular cast iron

22. Puddling is the process employed for converting :
(A) Iron ore into pig iron
(B) Pig iron into wrought iron
(C) Pig iron into cast iron
(D) None

23. The melting point of mild steel in degree centigrade is about :
(A) 850
(B) 1000
(C) 1250
(D) 1500

24. Which is the magnetic allotrope of iron?
(A) α iron
(B) β iron
(C) γ iron
(D) None

25. Austempering is a heat treatment process used to obtain greater :
(A) Ductility
(B) Hardness
(C) Toughness
(D) Brittleness

26. 18/8 stainless steel contains :

(A) 18% Vanadium, 8% Chromium
(B) 18% Chromium, 8% Nickel
(C) 18% Tungston, 8% Nickel
(D) 18% Tungston, 8% Chromium

27. Muntz metal contains copper and zinc in the ratio :

(A) 1 : 1
(B) 2 : 3
(C) 3 : 2
(D) 1 : 4

28. Monal metal is an alloy of :

(A) Nickel and Copper
(B) Copper and Chromium
(C) Nickel and Chromium
(D) None

29. The hardness of a lathe bed material should be measured by :

(A) Rockwell tester
(B) Brinell Hardness tester
(C) Vickers Hardness tester
(D) None

30. White metal is an alloy of lead with :

(A) Aluminium
(B) Zinc
(C) Tin
(D) Bismuth

31. The forging of steel specimen is done at a temperature of :

(A) 400°C
(B) 800°C
(C) 1100°C
(D) 1500°C

32. Which one of the following is not an application of forging?

(A) Rail sections
(B) Chisels
(C) Brake pedal of an automobile
(D) Steel balls of ball bearing

33. The process of removing the burns or flash from a forged component in drop forging is called :

(A) Swaging
(B) Perforating
(C) Trimming
(D) Fettling

34. The electric resistance welding operates with :

(A) Low current and high voltage
(B) High current and low voltage
(C) Low current and low voltage
(D) High current and high voltage

35. Spot welding, projection welding and seam welding belong to the category of :

(A) Arc welding
(B) Thermit welding
(C) Forge welding
(D) Resistance welding

36. The number of zones of heat generation in spot welding are :
(A) 2 (B) 3
(C) 5 (D) 7

37. Which one of the following is not a fusion welding process?
(A) Gas welding (B) Arc welding
(C) Resistance welding (D) Brazing

38. The ratio between oxygen and acetylene gases for neutral flame in gas welding is :
(A) 2 : 1 (B) 1 : 1
(C) 1 : 2 (D) 4 : 1

39. Thermit, used in thermit welding process is a mixture of :
(A) Charcol and Aluminium (B) Aluminium and Iron Oxide
(C) Charcol and Iron Oxide (D) Charcol, Aluminium and Iron Oxide

40. The temperature developed during a thermit welding process is in the order of :
(A) 1500°C (B) 2000°C
(C) 2500°C (D) 3500°C

41. The current value in the arc welding is decided by :
(A) Speed of travel (B) Plate thickness
(C) Welded length (D) Electrode size

42. The coating material of an arc welding contains :
1. Deoxidizing agent 2. Molten drops
3. Weld pool
Select the correct answer using the code given below
(A) 1,2 and 3 (B) 1 and 2
(C) 2 and 3 (D) 1 and 3

43. The straight polarity in ac arc welding is recommended for welding :
(A) Aluminum (B) Nickel
(C) Mild steel (D) Bronze

44. Which of the following welding methods uses pool of molten metal?
(A) Submerged arc welding (B) Resistance welding
(C) Plasma welding (D) None

45. The welding zone in the TIG arc welding is shielded by an atmosphere of :

(A) Oxygen Gas (B) CO_2

(C) Hydrogen (D) Helium

46. Which of the following welding techniques uses a non consumable electrode?

(A) MIG (B) TIG

(C) Submerged arc (D) Thermit

47. Vacuum environment is required in :

(A) Ultrasonic welding (B) Laser beam welding

(C) Electron beam welding (D) None

48. High speed electron beam of electron beam welding is focused on the weld spot using :

(A) Vacuum lens (B) Inert gas lens

(C) Optical lens (D) Magnetic lens

49. Grey iron is usually welded using the following method :

(A) TIG (B) MIG

(C) Arc (D) Gas

50. Weld spatter is :

(A) a welding defect (B) an electrode

(C) a flux (D) none

51. All of the following are units of thermal conductivity except :

(A) kcal/m-hr-°C (B) kj/m-hr-k

(C) W/m-s-k (D) cal/cm-s-°C

52. A composite wall of a furnace has two layers of equal thickness with thermal conductivities in the ratio 3 : 2. What is the ratio of temperature drop across the two layers :

(A) 2 : 3 (B) 3 : 2

(C) 1 : 2 (D) None

53. Critical thickness of insulation for a sphere with thermal conductivity k and convective heat transfer coefficient h is given by :

(A) 2k/h (B) k/h

(C) k/4h (D) k/2h

54. For a perfectly black body :

(A) Absorptivity $\alpha = 1$, Reflectivity $\rho = 0$ and transmissivity $\tau = 0$

(B) $\alpha = \tau = 0$ and $\rho = 1$

(C) $\alpha = \rho = 0$ and $\tau = 1$

(D) None

55. The intensity of solar radiation on earth is :

(A) 0.5 kW/m^2 (B) 1 kW/m^2

(C) 2 kW/m^2 (D) 5 kW/m^2

56. If the temperature of a hot body is increased by 50% the amount of radiation emitted by it would increase by nearly :

(A) 50% (B) 100%

(C) 200% (D) 500%

57. The value of shape factor for two infinite parallel planes separated by a distance x is :

(A) 0 (B) 1

(C) 0.5 (D) x

58. The ratio of heat transfer by convection to that by conduction is called :

(A) Stanton Number (B) Nusselt Number

(C) Biot Number (D) Peclet Number

59. Which dimensionless number has a significant role in natural convection?

(A) Grashoff Number (B) Peclet Number

(C) Mach Number (D) None

60. For the same operating temperature limits the COP of the heat pump equals :

(A) COP of refrigerator (B) 1 + COP of Refrigerator

(C) COP of Refrigerator –1 (D) None

61. A Carnot refrigerator rejects 3000 kJ of heat at 400 K while using 1000 kJ of work. The lowest operating temperature in the cycle should be about :

(A) 288 K (B) 300 K

(C) 267 K (D) 273 K

62. The refrigeration system of a passenger aircraft works on reversed :

(A) Brayton Cycle (B) Atkinson cycle

(C) Ericson cycle (D) Carnot cycle

63. During which component of vapour compression refrigeration system, the enthalpy remains Constant :

(A) Evaporator (B) Compressor

(C) Throttle Valve (D) None

64. One tone of refrigeration is equal to :

(A) 3.5 kW (B) 5 kW

(C) 10 kW (D) 12.5 kW

65. The ignition temperature of diesel is about :

(A) 250°C (B) 400°C

(C) 600°C (D) 750°C

66. Knocking tendency in SI engine reduces with increasing :

(A) Compression Ratio (B) Wall temperature

(C) Engine Speed (D) None

67. The two reference fuels used for cetane rating are :

(A) Cetane and iso octane

(B) Cetane and tetra ethyl lead

(C) Cetane and alpha methyl naphthalene

(D) None

68. For a two stage reciprocating air compressor with perfect inter cooling the work input will be minimum if the supply pressure P1, the intercooler pressure P2 and the delivery pressure P3 satisfy the relation :

(A) $P2 = (P1*P3)^{0.5}$ (B) $P2 = (P1+P3)/2$

(C) $P2 = P1/P3$ (D) None

69. Optimum pressure ratio for maximum specific output for ideal gas turbine power plant operating at initial temperature of 300 K and the maximum temperature of 1000 K is closer to :

(A) 4 (B) 8

(C) 12 (D) 16

70. The use of regeneration in a gas turbine cycle increases :

(A) Efficiency but has no effect on output

(B) Output but has no effect on efficiency

(C) Both efficiency and output

(D) None

71. Which one of the following is a lower pair?

(A) Cam and follower (B) Toothed gearing

(C) Shaft in a bearing (D) None

72. The average tensions on the tight and slack side of a flat belt drive system are 700 N and 400 N respectively. If the linear velocity of the belt is 5 m/s, the power transmitted by the system would be about :

(A) 1.5 kW (B) 3 kW

(C) 5 kW (D) 10 kW

73. In a 6 × 20 wire rope, number 6 indicates :

(A) Diameter of the wire rope in mm

(B) Number of strands in the wire rope

(C) Number of wires

(D) None

74. The motion transmitted between the teeth of two spur gears is generally :

(A) Sliding (B) Rolling

(C) Rotary (D) Partly sliding and partly rolling

75. The product of circular pitch and diametral pitch equals :

(A) π (B) 1

(C) Infinity (D) None

76. In a flat belt drive, the belt call be subjected to maximum tension T and a centrifugal tension Tc. For maximum power transmission :

(A) T = Tc (B) T = 2Tc

(C) T = 3Tc (D) T = 4Tc

77. Which of the following is not a common section of V belts?

(A) F (B) C

(C) E (D) A

78. A rack is a gear of infinite :

(A) Pitch (B) Module

(C) Diameter (D) Number of teeth

79. The circular pitch of a toothed wheel with 24 teeth and a module of 4.25 mm is :

(A) 1.35 mm (B) 4.25 mm

(C) 6.67 mm (D) 13.35 mm

80. The maximum efficiency of a worm and worm wheel system in terms of friction angle Φ is :

(A) $1 - \cos / 1 + \cos \Phi$ (B) $1 - \sin \Phi / 1 + \cos \Phi$

(C) $1 - \sin \Phi / 1 + \sin \Phi$ (D) $1 - \tan \Phi / 1 + \tan \Phi$

81. In a multiple disc clutch, n1 and n2 are the number of discs on the driving and driven shafts respectively. Then the number of pairs of contact surface is :

(A) n1 + n2 (B) n1 + n2 – 1

(C) n1 – n2 (D) None

82. The type of brakes commonly used in automobiles is :

(A) Shoe brake (B) Band brake

(C) Band and Block brake (D) None

83. A reverted gear train is one in which the output and input shaft :

(A) Rotate in opposite directions (B) Are coaxial

(C) Are at right angles to each other (D) None

84. 20° gears have a module pitch of 40 mm. The number of teeth on the gear is 40. If addendum is equal to one module what is the radius of addendum circle :

(A) 36 mm (B) 42 mm

(C) 56 mm (D) 94 mm

85. When two spur gears having involute profiles on their teeth engage the line of action is tangential to :

(A) Pitch circle (B) Dedundum circle

(C) Addendum circle (D) Base circle

86. A 60 mm long and 6 mm thick fillet weld carries a steady load of 15 kN along the weld. The shear strength of the weld material is 200 MPa. The factor of safety is :

(A) 2.4 (B) 3.4

(C) 4.8 (D) 6.8

87. In a butt weld joint the throat of weld as compared to size of the weld is in the ratio :

(A) 2 : 1 (B) 1 : 2

(C) 1 : 1 (D) 1 : 3

88. A circular solid rod of diameter d welded to a right flat plate by a circular fillet weld of throat thickness t is subject to a twisting moment T. The maximum shear stress induced in the weld is :

(A) $T / \pi td^2$ (B) $2T / \pi td^2$

(C) $4T / \pi td^2$ (D) $2T / \pi td^3$

89. The efficiency of a power screw is maximum when the lead angle in terms of friction angle Φ is :

(A) $\pi/2 - \Phi/2$ (B) $\pi/2 - \Phi$

(C) $\pi - \Phi/2$ (D) $\pi - \Phi$

90. In a BSW thread the angle between the flanks is :

(A) 29° (B) 47.5°

(C) 55° (D) 60°

91. A high pressure angle for spur gears leads to :

(A) Minimum axial thrust (B) Wide base and stronger teeth

(C) More interference (D) None

92. A worm has a lead angle of 22.5°. This corresponds to a helix angle of :

(A) 22.5° (B) 45°

(C) 55° (D) 67.5°

93. Which type of spring is usually used for an automobile clutch?

(A) Spiral spring (B) Leaf spring

(C) Closed coil helical spring (D) None

94. The ratio between the mean diameter of the coil and diameter of wire is called :

(A) Spring rate
(B) Spring Constant
(C) Spring stiffness
(D) Spring index.

95. A spring with spring constant s has been cut into n equal parts. Each portion of the cut spring will have a spring constant equal to :

(A) s
(B) s/n
(C) n/s
(D) ns

96. Which of the following is not a friction clutch?

(A) Plate clutch
(B) Jaw clutch
(C) Cone clutch
(D) Centrifugal clutch

97. The maximum stress induced in a spiral spring in terms of Moment applied M, breadth of strip b and thickness of strip t is :

(A) $12M/bt^2$
(B) $4M/bt^2$
(C) $8M/bt^2$
(D) $16M/bt^2$

98. In design of helical springs the spring index is usually taken as :

(A) 8
(B) 10
(C) 12
(D) 16

99. The stress induced in the circular section wire of a closed coil helical spring in terms of axial load W, mean coil diameter D and wire diameter d is :

(A) $8WD/\pi d^3$
(B) $12WD/\pi d^3$
(C) $16WD/\pi d^3$
(D) $32WD/\pi d^3$

100. Spring stiffness is :

(A) Load per unit deflection
(B) Load carrying capacity of the spring
(C) Ratio of mean coil diameter to wire diameter
(D) None.
