

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) $0.47 \text{ m}^3/\text{sec}$ (B) $0.047 \text{ m}^3/\text{sec}$
(C) $0.00047 \text{ m}^3/\text{s}$ (D) $4.7 \text{ m}^3/\text{s}$
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) Helmholtz 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 allotope 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) CO₂
(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) $1 + \text{COP of Refrigerator}$
 - (C) $\text{COP of Refrigerator} - 1$
 - (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 P_1 , the intercooler pressure P_2 and the delivery pressure P_3 satisfy the relation :
- (A) $P_2 = (P_1 \cdot P_3)^{0.5}$ (B) $P_2 = (P_1 + P_3)/2$
(C) $P_2 = P_1/P_3$ (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 can be subjected to maximum tension T and a centrifugal tension T_c . For maximum power transmission :
- (A) $T = T_c$
 - (B) $T = 2T_c$
 - (C) $T = 3T_c$
 - (D) $T = 4T_c$