227/2023

Maximum : 100 marks

Time : 1 hour and 30 minutes

1. For stable equilibrium :

    (A) Metacentre is below the centre of gravity

    (B) Metacentre is above the centre of gravity

    (C) Metacentre is at centre of gravity

    (D) Metacentre having no effect on centre of gravity

2. The instantaneous position of all fluid particles which have passed through a given point is called :

    (A) Potential line   (B) Path line

    (C) Stream line   (D) Streak line

3. A fresh water lake has maximum depth of 60 m and mean atmospheric pressure is 91 kPa. The value of absolute pressure in kPa at maximum depth is ——————— (take $g = 10$ m/s^2).

    (A) 600   (B) 509

    (C) 691   (D) 680

4. Choose the correct assumptions of Bernoulli's equation :

    (i) Steady flow

    (ii) Incompressible flow

    (iii) Rotational flow

    (A) Only (i) and (iii)   (B) Only (i) and (ii)

    (C) Only (ii) and (iii)   (D) All the above (i), (ii) and (iii)

5. For small orifice the head of the liquid from the centre of the orifice is more than ——————— times the depth of orifice.

    (A) two   (B) three

    (C) four   (D) five

6. The sheet of water flowing through a notch is called :

   (A) Crest   (B) Sill

   (C) Nappe   (D) Weir

7. Which of the following statements are correct for the frictional resistance for turbulent flow?

   (i) Proportional to density of fluid

   (ii) Inversely Proportional to area of surface in contact

   (iii) Independent of pressure

   (iv) Inversely proportional to square of velocity

        (A) Only (i) and (ii)   (B) Only (i) and (iii)

        (C) Only (ii) and (iv)   (D) All the above (i), (ii), (iii) and (iv)

8. The coefficient of bend 'k' depends on :

   (i) Angle of bend

   (ii) Radius of curvature of bend

   (iii) Diameter of pipe

   (iv) Length of bend

        (A) All the above (i), (ii), (iii) and (iv)   (B) Only (ii), (iii) and (iv)

        (C) Only (i), (ii) and (iii)   (D) Only (i), (iii) and (iv)

9. The pressure rise due to water hammer in pipes depends on :

   (i) The length of the pipe

   (ii) Velocity of flow of water in pipe

   (iii) Time taken to close the valve

   (iv) Elastic property of the material of the pipe

        (A) Only (i), (ii) and (iii)   (B) Only (i), (iii) and (iv)

        (C) Only (ii), (iii) and (iv)   (D) All the above (i), (ii), (iii) and (iv)

10. In an fluid flow if the force due to compressibility is negligible then the equations of motions are called :

    (A)   Reynold's equation of motion

    (B)   Navier- Stokes equation of motion

    (C)   Euler's equation of motion

    (D)   Bernoulli's equation of motion

11. A jet of liquid with relative density 0.8 strikes normally a flat plate with a velocity of 10 m/s. The jet has an area of 0.04 m². The force exerted by the jet on the plate is :

    (A)   120 N   (B)   1.2 kN

    (C)   3.2 kN   (D)   320 N

12. An adjustable propeller turbine is called :

    (A)   Pelton turbine   (B)   Francis turbine

    (C)   Banki turbine   (D)   Kaplan turbine

13. Which of the following water turbine does not require draft tube?

    (A)   Pelton turbine   (B)   Propeller turbine

    (C)   Francis turbine   (D)   Kaplan turbine

14. Air vessel is used in reciprocating pump to obtain :

    (A)   Reduction in suction head

    (B)   Continuous supply of water at uniform rate

    (C)   Rise in delivery head

    (D)   Save pump from cavitation

15. The specific speed of a hydraulic turbine depends upon :

    (A)   Speed and power developed

    (B)   Speed and discharge

    (C)   Speed, discharge and head of water

    (D)   Speed, power developed and head of water

16. Hydraulic efficiency of a hydraulic turbine is the ratio of the :

(A) Runner power to water power   (B) Shaft power to the water power

(C) Shaft power to the runner power   (D) Water power to the shaft power

17. The function of governor in a hydraulic turbine is to :

(A) Maintain the discharge constant under all conditions

(B) Maintain the power constant under all conditions

(C) Maintain the speed constant under all conditions

(D) Maintain the head constant under all conditions

18. Slip of reciprocating pump becomes negative when :

(A) Theoretical discharge is equal to actual discharge

(B) Actual discharge is more than theoretical discharge

(C) Theoretical discharge is more than actual discharge

(D) Pump is running at high head

19. Cavitation in centrifugal pumps can be reduced by :

(A) Reducing the suction head   (B) Throttling the discharge

(C) Increasing the flow velocity   (D) Reducing the discharge

20. A single acting reciprocating pump having single cylinder area of 0.3 m^2 and stroke length 0.1 m running at a speed of 180 rpm. Theoretical discharge of the pump will be :

(A) 0.21 m^3/s   (B) 0.09 m^3/s

(C) 0.54 m^3/s   (D) 0.19 m^3/s

21. In the resistance thermometer the charge in resistance of a metal wire due to its changes in temperature :

(A) Physical Property   (B) Thermometric Property

(C) Chemical Property   (D) Thermal Property

22. As mixing is also a irreversible process it also decreases availability and increases unavailability of the system. The loss of availability energy is always associated with never increase :

(A) Enthalpy   (B) Entropy

(C) Thermal Resistance   (D) Physical Property

23. Heat pump is a device which working in a cycle delivers energy from low temperature system usually work or energy as required as input :

    (A)   Latent Heat   (B)   High Specific Heat

    (C)   Lower Enthalpy   (D)   Higher Temperature

24. We have defined the criterion of reversibility and discussed some factors that render a process irreversible we have also started that it is impossible to have an engine of 100% efficiency but we have not answered the question. What is the maximum value of thermal efficiency if not?

    (A)   75%   (B)   65%

    (C)   85%   (D)   100%

25. The specific heat of a substance at a constant volume C_v is defined as the rate of change of specific internal energy with respect to temperature which with volume is held constant :

    (A) $C_v = \left(\dfrac{\partial v}{\partial t}\right)_v$ (B) $C_v - \left(\dfrac{\partial u}{\partial t}\right)_s$

    (C) $C_v = \left(\dfrac{\partial u}{\partial s}\right)_v$ (D) $C_v = \left(\dfrac{\partial u}{\partial v}\right)_T$

26. In the process occurs on account of a finite temperature gradient is called :

    (A)   Thermal irreversibility   (B)   Chemical irreversibility

    (C)   Mechanical Irreversibility   (D)   External Irreversibility

27. Steady flow means that the rates of flow of mass and change across the control surface are :

    (A)   Constant   (B)   Steady

    (C)   Equal   (D)   Safety

28. The conservation of mass if there is no accumulation of mass with in the control volume, the mass flow rate entering must equal the mass flow rate leaving :

    (A) $W_1 = W_2$ (B) $W_1 - W_2 = 1$

    (C) $W_1 + W_2 = 1$ (D) $W_1 \div W_2 = 1$

29. Consider a reversible and an irreversible engine to operate between same limit :

    (A)   Temperature   (B)   Volume

    (C)   Mass   (D)   Entropy

30. The changes of the entropy of the principle of increase of entropy of the system it is loosing heat :

    (A)   Latent heat   (B)   Pressure

    (C)   Temperature   (D)   Thermal

31. A good fuel is one which has :

    (A)   Low ignition point and low calorific value

    (B)   High ignition point and low calorific value

    (C)   Low ignition point and high calorific value

    (D)   High ignition point and high calorific value

32. Calorific value of liquid fuel is the amount of heat liberated :

    (A)   By complete combustion of 1 m³ of fuel

    (B)   When temperature of the fuel is raised by 1°C

    (C)   By complete combustion of 1 kg of fuel

    (D)   None of the above

33. Bomb calorimeter is used to determine :

    (A)   Higher calorific value of solid and liquid fuels at high pressure

    (B)   Lower calorific value of gaseous fuel at high pressure

    (C)   Higher calorific value of solid and liquid fuels at constant pressure

    (D)   Lower calorific value of gaseous fuel at constant pressure

34. To calculate net calorific value, product of combustion are :

    (A)   Cooled to room temperature   (B)   Allowed to escape

    (C)   Collected   (D)   Heated

35. Mass of excess air supplied is equal to :

    (A) $\dfrac{100}{23} \times$ Mass of excess oxygen   (B) $\dfrac{23}{100} \times$ Mass of excess carbon

    (C) $\dfrac{23}{100} \times$ Mass of excess oxygen   (D) $\dfrac{100}{23} \times$ Mass of excess carbon

36. Steam at 8 bar has a sensible heat of 720 kJ/kg and latent heat of 2045 kJ /kg. If the steam is 80% dry, then the total enthalpy is :

   (A)   2765 kJ/kg   (B)   2356 kJ/kg

   (C)   2621 kJ/kg   (D)   2945 kJ/kg

37. The critical pressure ratio for initially super heated steam is :

   (A)   0.528   (B)   0.546

   (C)   0.577   (D)   0.582

38. To reduce the speed of impulse turbines to practical limits, the method used is :

   (A)   Velocity compounding   (B)   Pressure compounding

   (C)   Pressure-velocity compounding   (D)   All of the above

39. The cycle generally used for gas turbine is :

   (A)   Rankine cycle   (B)   Otto cycle

   (C)   Carnot cycle   (D)   Brayton cycle

40. In case of reaction steam turbine :

   (A)   The steam is expanded in nozzle only

   (B)   The steam is expanded in moving blades only

   (C)   The steam is expanded both in fixed and moving blades continuously

   (D)   None of the above

41. The modulus of Elasticity (E) and Bulk modulus (K) are related by —————— (Take Poisson's ratio = $\dfrac{1}{m}$).

   (A) $K = \dfrac{mE}{3(m-2)}$ (B) $K = \dfrac{mE}{3(m+2)}$

   (C) $K = \dfrac{mE}{3(m-1)}$ (D) $K = \dfrac{mE}{3(m+1)}$

42. The rod of length L tapers uniformly from a diameter D to a diameter B and carries an axial load of P then the extension of the road :

(A) $\dfrac{\pi PL}{4EDB}$

(B) $\dfrac{4PL}{\pi EDB}$

(C) $\dfrac{\pi EL}{4PDB}$

(D) $\dfrac{\pi PEL}{4DB}$

43. For the bars of composite section, which is true :

(A) The load carried by different materials is the same as total extension load

(B) The young's modulus of different materials is same

(C) The total external load is not equal to the total sum of the load carried by different materials

(D) None of the above

44. The point of contraflexure will occurs when :

(A) Bending Moment changes its sign

(B) Shear force reduces to zero

(C) Shear force changes its sign

(D) None of the above

45. The torsional rigidity of a shaft is equal to :

(A) Product of modulus of elasticity and polar moment of inertia

(B) Product of Young's modulus and polar moment of inertia

(C) Product of modulus of rigidity and polar moment of inertia

(D) Product of Bulk modulus and polar moment of inertia

46. The crippling load according to Euler's theory of long column when both ends of the column are hinged :

(A) $\dfrac{4\pi^2 EI}{l^2}$

(B) $\dfrac{\pi^2 EI}{4l^2}$

(C) $\dfrac{2\pi^2 EI}{l^2}$

(D) $\dfrac{\pi^2 EI}{l^2}$

47. The radius of gyration is given by the expression for a uniform body, (Take I-Moment of Inertia, M-Mass moment, A-Area) :

(A) $\sqrt{\left(\dfrac{M}{I}\right)}$

(B) $\sqrt{\left(\dfrac{I}{A}\right)}$

(C) $\sqrt{\left(\dfrac{A}{I}\right)}$

(D) $\sqrt{\left(\dfrac{IM}{A}\right)}$

48. Thermal Strain is given by (α-Coefficient of linear expansion, T- Rise in Temperature, E-Young's Modulus, ε -Strain) :

(A) αT

(B) $L\alpha T$

(C) $E\alpha T$

(D) $\varepsilon\alpha T$

49. Mohr's circle reduces to a point :

(A)   Equal and opposite axial stresses on two mutually perpendicular planes, the planes being free of shear

(B)   Uniaxial stress only

(C)   For a point in hydrostatic fluid

(D)   Pure shear

50. The ratio of thickness to internal diameter of a cylindrical shell is less than ——————, the shell is called a thin cylinder.

(A)   1/10

(B)   1/20

(C)   2/10

(D)   10/1

51. Which of the following represent the engineering requirements of materials?

(A)   Fabrication requirement

(B)   Service requirement

(C)   Economic requirement

(D)   All of the above

52. Effect of adding phosphorous to cast iron :

(A)   Reduce graphitisation

(B)   Aids fusibility and fluidity

(C)   Increase toughness

(D)   All of the above

53. Special kind of annealing process used for wire, spring etc to prevent them from fracture and to improve strength and toughness is:

(A)   Process annealing

(B)   Spherodise annealing

(C)   Patenting annealing

(D)   Isothermal annealing

[P.T.O.]

54. Normalizing of hypoeutectoid steel is done :

    (A)   Above upper critical temperature (A3)

    (B)   Below upper critical temperature (A3)

    (C)   Above lower critical temperature (A1)

    (D)   Below lower critical temperature (A1)

55. The surface hardening process also known as cementation is :

    (A)   Cyniding   (B)   Carbonitriding

    (C)   Flame hardening   (D)   Carburizing

56. Muntze metal is the combination of :

    (A)   59% Cu and 41% Sn   (B)   70% Cu and 30% Sn

    (C)   75% Cu and 25% Sn   (D)   66% Cu and 34% Sn

57. Addition of silicon to steel increase :

    (A)   Electrical property

    (B)   Imparts fatigue, strength and resistance to steel

    (C)   Increases ductility

    (D)   All of the above

58. Which of the following is a thermoplastic?

    (A)   Bakelites   (B)   Nylons

    (C)   Alkyds   (D)   Aminos

59. ——————— is an example for hard magnetic material.

    (A)   Mu Metal   (B)   Rho Metal

    (C)   Rem Alloy   (D)   None of the above

60. TTT diagram illustrate the duration needed for isothermal transformation from :

    (A)   Austenite to Pearlite   (B)   Austenite to Ferrite

    (C)   Pearlite to Ferrite   (D)   Pearlite to Martensite

61. What is the purpose of tongue and groove joint in carpentry work?

    (A)   To increase breadth   (B)   To increase Length

    (C)   To increase thickness   (D)   Angle Joining

62. Which gas flame is used in welding of bronze?

    (A)   Neutral flame   (B)   Oxidizing flame

    (C)   Carburizing flame   (D)   All of the above

63. What is the substance used to dissolve acetylene in a DA cylinder?

    (A)   Ethylene   (B)   Benzene

    (C)   Ethyl   (D)   Liquid acetone

64. Which is the folded edge on a sheet metal object?

    (A)   Seam   (B)   Beading

    (C)   Hem   (D)   Clips

65. In moulding sand preparation, the ability of sand particles to stick together is known as :

    (A)   Adhesiveness   (B)   Collapsibility

    (C)   Cohesiveness   (D)   Permeability

66. The cutting edge angle of a hot chisel is :

    (A)   60°   (B)   30°

    (C)   45°   (D)   35°

67. The relief angle of single point cutting tool varies from :

    (A)   3° – 5°   (B)   5° – 10°

    (C)   8° – 15°   (D)   5° – 15°

68. Circumference of a work piece is divided in 6 equal division using index plate of 24 slots, the required indexing ratio is :

    (A)   12   (B)   4

    (C)   3   (D)   2

69. In shaper machine, the stroke Length of ram can be increased by :

    (A)   Decreasing slotted Lever length

    (B)   Decreasing radial distance of crank pin

    (C)   Increasing radial distance between fixed centres

    (D)   Increasing radial distance of crank pin

70. What is the distance between two adjacent teeth in a 25 TPI hack saw blade?

    (A) 0.25 mm   (B) 1/25 mm

    (C) 1 mm   (D) 25 mm

71. The ratio of the eccentricity of a hyperbola to that of an ellipse is :

    (A) Less than one   (B) Greater than one

    (C) Either (A) or (B)   (D) Equal to one

72. In the first angle of projection, the top view (TV) and the front view (FV) of the object lie :

    (A) TV and FV above xy-line

    (B) TV above xy-line and FV below xy-line

    (C) TV below xy-line and FV above xy-line

    (D) TV and FV below xy-line

73. In isometric projections all the edges parallel to isometric axes are foreshortened such that the ratio of isometric length to true length is equal to :

    (A) 0.816   (B) 0.707

    (C) 0.577   (D) 0.617

74. The method used for the development of spheres and paraboloids is :

    (A) Parallel line method   (B) Radial line method

    (C) Approximate method   (D) Triangulation method

75. A single riveted lap joint is made in plates of thickness 8 mm with 20 mm diameter rivets. If the permissible shear stress in rivets is 70 N/mm², find the shearing resistance of a single rivet :

    (A) 21600 N   (B) 22000 N

    (C) 26278 N   (D) 32000 N

76. If t = throat thickness, h = weld leg, l = length of weld and σ_t = allowable tensile strength of weld metal, then the tensile strength of for a single transverse fillet welded joint is :

    (A) $0.717 \, h \times l \times \sigma_t$ (B) $1.414 \, h \times l \times \sigma_t$

    (C) $0.717 \, t \times l \times \sigma_t$ (D) $1.414 \, t \times l \times \sigma_t$

77. The types of threads commonly used in screw mechanisms for industrial machines are :

- (A) Knuckle thread
- (B) Metric thread
- (C) Buttress thread
- (D) Acme thread

78. The types of parallel key which transmits turning moment and also permits axial movement between shaft and hub is :

- (A) Woodruff key
- (B) Gib-head key
- (C) Feather key
- (D) Square sunk key

79. Power transmitted through a flat belt drive becomes maximum when the ratio of maximum tension to centrifugal tension equals :

- (A) 3/2
- (B) 3
- (C) 2
- (D) 4/3

80. The angle between the tangent to the thread helix on the picth cylinder and axis of worm in a worm gear is called :

- (A) Lead angle
- (B) Pressure angle
- (C) Pitch angle
- (D) Helix angle

81. Which among the following boilers are Fire Tube Boilers?

- (i) Lancashire Boiler
- (ii) LaMont Boiler
- (iii) Benson Boiler
- (iv) Cornish Boiler
    - (A) (i) and (iv)
    - (B) (ii) and (iii)
    - (C) (i) and (iii)
    - (D) (ii) and (iv)

82. Which among the following are Boiler Mountings?

- (i) Steam Separator
- (ii) Pressure Gauge
- (iii) Steam Stop Valve
- (iv) Economizer
    - (A) Only (iv)
    - (B) (ii) and (iii)
    - (C) (i) and (ii)
    - (D) (i) and (iii)

83. Which of the following chemicals are the ingredients of the mixture used for comparing the ignition quality (knocking tendency) of S.I Engines fuels?

(i) Iso-Octane.

(ii) α-methyl naphthalene.

(iii) n – heptane.

(iv) hepta-methyl nonane.

(A) (i) and (iv) (B) (ii) and (iii)

(C) (iii) and (iv) (D) (i) and (iii)

84. What is the effect of short ignition delay, in knocking tendency of 4 stroke I.C. Engines?

(A) Reduces the knocking tendency in both petrol and diesel engines

(B) Increases the knocking tendency in diesel engines and reduces the knocking tendency in petrol engines

(C) Reduces the knocking tendency in diesel engines and increases the knocking tendency in petrol engines

(D) Increases the knocking tendency in both the petrol engines and diesel engines

85. Which of the following statements is correct regarding G.D.I. electronic fuel Injection system?

(A) The fuel is directly injected into the venturi

(B) The fuel is directly injected into the throttle body

(C) The fuel is directly injected into the intake port

(D) The fuel is directly injected into the engine cylinder or combustion chamber

86. Which of the following statements are correct regarding Cohran Boilers?

(i) It is a water tube boiler.

(ii) It is a horizontal boiler.

(iii) It is a fire tube boiler.

(iv) It is a vertical boiler.

(A) (ii) and (iii) are correct (B) (i) and (ii) are correct

(C) (iii) and (iv) are correct (D) (i) and (iv) are correct

87. The compression ratio of a square engine having a cylinder bore of 8 cm and clearance volume of 16π cm^3 :

(A) 9 : 1 (B) 10 : 1

(C) 8 : 1 (D) 11 : 1

88. The theoretically correct air – fuel ratio for most effective combustion in petrol engine is :

    (A)   14.7 : 1 by weight   (B)   14.7 : 1 by volume

    (C)   15.7 : 1 by weight   (D)   15.7 : 1 by volume

89. Which among the following is not a part of C.R.D.I system?

    (A)   Cooling water Temperature Sensor   (B)   Inlet Air Temperature Sensor

    (C)   Accelerator Pedal Sensor   (D)   Throttle Position sensor

90. Which among the following are Boiler Accessories?

    (i)   Steam trap

    (ii)   Fusible Plug

    (iii) Water Level Indicator

    (iv) Pressure Reducing Valve

    (A)   (i) and (iv)   (B)   (i) and (ii)

    (C)   (ii) and (iii)   (D)   (ii) and (iv)

91. Heat transfer takes place according to the ——————— law of thermodynamics.

    (A)   First   (B)   Second

    (C)   Third   (D)   Zeroth

92. Transfer of heat in liquids and gases is essentially due to :

    (A)   Convection   (B)   Conduction

    (C)   Radiation   (D)   Both (A) and (B)

93. According to Fouriers's law of heat conduction the heat flow (Q) is given by, when the area of flow (A), temperature difference in face (dt), thickness of body (dx) and thermal conductivity (K) :

    (A) $Q = - K \, (dt/dx)$ (B) $Q = KA \, (dx/dt)$

    (C) $Q = - KA \, (dt/dx)$ (D) $Q = - KA \, (dx/dt)$

94. The emissive power of black body per unit area per unit time varies :

    (A)   Directly with the absolute temperature

    (B)   Directly with square of absolute temperature

    (C)   Directly with third power of absolute temperature

    (D)   Directly with fourth power of absolute temperature

95. One Ton of refrigeration is equivalent to :

- (A) 1 kW
- (B) 2.5 kW
- (C) 3.5 kW
- (D) 4.5 kW

96. For the same operating temperature the COP of a heat pump equals :

- (A) COP of refrigerator
- (B) COP of refrigerator + 1
- (C) COP of refrigerator – 1
- (D) 1 / COP of refrigerator

97. A good refrigerant should have :

- (A) High specific volume and low boiling point
- (B) High critical pressure and high boiling point
- (C) High specific heat of liquid low specific heat of vapour
- (D) High latent heat of vaporisation and low freezing point

98. On a Psychometric chart relative humidity is represented by :

- (A) Curved line
- (B) Inclined line
- (C) Vertical line
- (D) Horizontal line

99. Dew point depression represents the difference between :

- (A) Dew point temperature and saturation temperature
- (B) Wet bulb temperature and dew point temperature
- (C) Dry bulb temperature and wet bulb temperature
- (D) Dry bulb temperature and dew point temperature

100. The capacity of a refrigerating machine is expressed as :

- (A) Lowest temperature attained
- (B) Inside volume of cabinet
- (C) Rate of abstraction of heat from the space being cooled
- (D) Gross weight of the machine in tons

———————

SPACE FOR ROUGH WORK

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