**093/2024**

1.  The property of a material by which it can be beaten or rolled into thin plates is called :
    (A) Ductility
    (B) Elasticity
    (C) Malleability
    (D) Plasticity

2.  The angle between major principal plane and minor principal plane for a strained body is :
    (A) 30°
    (B) 60°
    (C) 90°
    (D) 45°

3.  A body is subjected to a direct tensile stress of 300 MPa in one plane accompanied by a simple shear stress of 200 MPa. The maximum normal stress on the plane will be :
    (A) 400 MPa
    (B) 350 MPa
    (C) 300 MPa
    (D) 250 MPa

4.  Which of the following is not a basic type of strain?
    (A) Shear strain
    (B) Area strain
    (C) Volume strain
    (D) Compressive strain

5.  The strength of beam depends merely on :
    (A) Flexural rigidity
    (B) Moment of inertia
    (C) Moment of resistance
    (D) Modulus section

6.  What is the effective length of a column at both ends fixed?
    (A) L/3
    (B) L/2
    (C) 2 L
    (D) L

7.  How does Young's modulus vary with the increase in temperature?
    (A) First increases and then decreases
    (B) Remains constant
    (C) Decreases
    (D) Increases

8.  Factor of safety is :
    (A) Compressive stress / Ultimate stress
    (B) Tensile stress / Permissible stress
    (C) Ultimate stress / Shear stress
    (D) Ultimate stress / Permissible stress

9.  Maximum shear stress of a solid shaft is given by :
    (A) $16T/\pi d$
    (B) $16T/\pi d^3$
    (C) $16T/\pi d^4$
    (D) $16T/\pi d^2$

**A**

**3**

**10.** Neutral axis of a beam always coincides with :
- (A) Axis passing through height h/2 from bottom
- (B) Axis passing through bottom of beam
- (C) Axis passing through height h/3 from bottom
- (D) Axis passing through centroid

**11.** The bending moment diagram for a cantilever with uniformly distributed load over the whole span will be :
- (A) Parabola
- (B) Deflection
- (C) Ellipse
- (D) Triangle

**12.** When mild steel is subjected to a tensile load, its fracture will conform to?
- (A) Granular shape
- (B) Cup and cone shape
- (C) Fibrous shape
- (D) Star shape

**13.** The triple point of a pure substance is represented by a point in :
- (A) P-V graph
- (B) P-T graph
- (C) U-V graph
- (D) All of the above

**14.** In an IC engine, the work input during the compression stroke is 200 kJ/kg. What is the change in internal energy of the working fluid if the heat rejected to the cooling water in the process is 100 kJ/kg?
- (A) 100 kJ/kg Gain
- (B) 100 kJ/kg Loss
- (C) 300 kJ/kg Gain
- (D) 300 kJ/kg Loss

**15.** The expansion of a gas against vacuum is called :
- (A) Vacuum expansion
- (B) Free expansion
- (C) Forced expansion
- (D) None of these

**16.** Statement I :   Heat cannot flow of itself from a body at lower temperature to a body at higher temperature, some work must be expended to achieve this.

Statement II :   Electrical energy is consumed to work the domestic refrigerator.

Select the correct answer from the following :
- (A) Statement I is correct, but Statement II is wrong
- (B) Statement II is correct, but Statement I is wrong
- (C) Both the Statements are correct, but Statement I is not the reason for Statement II
- (D) Both the Statements are correct, and the Statement I is the reason for Statement II

**17.** Match the following for a process in which $pv^n$ = constant :

(a)  Isentropic process                     (i)    $n=1$

(b)  Isothermal process                     (ii)   $n=-1$

(c)  Isobaric process                        (iii)  $n=1.4$

(d)  Isochoric process                       (iv)   $n=0$

                                             (v)    $n=\infty$

                                             (vi)   $0<n<1.4$

    (A)   (a) – (iii), (b) – (i), (c) – (iv), (d) – (v)

    (B)   (a) – (iii), (b) – (i), (c) – (iv), (d) – (vi)

    (C)   (a) – (iii), (b) – (ii), (c) – (iv), (d) – (v)

    (D)   (a) – (iii), (b) – (v), (c) – (iv), (d) – (i)

**18.** Select the wrong statement from the following :

    (A)   Energy of an isolated system is always constant

    (B)   Energy is an extensive property

    (C)   Specific volume is an intensive property

    (D)   When all the properties of a system have definite values, the system is said to exist in thermodynamic equilibrium

**19.** (i)    For an isolated system, $dS\leq0$

(ii)   For an isolated system, in a reversible process, $dS=0$

(iii)  For an isolated system, in an irreversible process, $dS\geq0$

Select the correct option from the following :

    (A)   Only (i) is correct          (B)   Only (i) and (ii) are correct

    (C)   Only (ii) and (iii) are correct   (D)   All are correct

**20.** Match the following :

(a)  $dU$                                    (i)    $-pdV-SdT$

(b)  $dH$                                    (ii)   $Vdp-SdT$

(c)  $dF$                                    (iii)  $TdS+Vdp$

(d)  $dG$                                    (iv)   $TdS-pdV$

    (A)   (a) – (iii), (b) – (ii), (c) – (iv), (d) – (i)

    (B)   (a) – (ii), (b) – (i), (c) – (iv), (d) – (iii)

    (C)   (a) – (iv), (b) – (iii), (c) – (i), (d) – (ii)

    (D)   (a) – (i), (b) – (iv), (c) – (iii), (d) – (ii)

**21.** Select the wrong statement from the following :
(A) Suction of air into the cylinder takes place at constant pressure in a Diesel cycle
(B) Burning of fuel takes place at constant pressure in a Diesel cycle
(C) Heat rejection process takes place at constant pressure in a Diesel cycle
(D) Heat addition takes place at constant pressure in a diesel cycle

**22.** Select the correct statement from the following :
(A) For same compression ratio, efficiency of Diesel cycle is more than that of Otto cycle
(B) For same compression ratio, efficiency of dual cycle is more than that of Otto cycle
(C) For the same maximum temperature and pressure, efficiency of Diesel cycle is less than that of Otto cycle
(D) None of these

**23.** A wall which is impermeable to the flow of heat is :
(A) A diathermic wall        (B) An adiabatic wall
(C) An isothermal wall       (D) None of these

**24.** In a cyclic process, heat transfers are +75 kJ, −25 kJ, +20 kJ and −15 kJ. What is the net heat loss during the cycle?
(A) 40 kJ                    (B) 45 kJ
(C) −45 kJ                   (D) None of these

**25.** Which of the following is not an advantage of reheating Rankine cycle?
(A) Less Maintenance is required
(B) There is improvement in thermal efficiency of the turbine
(C) There is an increased output of the turbine
(D) Final dryness fraction of the steam is improved

**26.** The ratio of heat drop over moving blade to the total heat drop in the stage of a reaction turbine is :
(A) Stage efficiency         (B) Degree of reaction
(C) Heat drop factor         (D) None of these

**27.** The frictional power of a single cylinder SI engine can be determined by :
(A) William's Line method    (B) Morse Test
(C) Motoring Test            (D) Any of the above

**28.** The Free Air Delivered (F.A.D.) is less than the displacement of the compressor because :
(A) The fluid resistance through the air intake and valves prevents the cylinder being fully charged with air at atmospheric conditions
(B) On entering the hot cylinder the air expands
(C) Certain loss is caused by leakage
(D) All of these

29. Adding insulation to a hot cylindrical pipe :
    (A) Increases the rate of heat transfer
    (B) Decreases the rate of heat transfer
    (C) Increases the rate of heat transfer upto a particular thickness and then decreases
    (D) None of these

30. The temperatures of the inner and outer surfaces of a 30 cm thick plane wall are 45°C and 25°C respectively. Thermal conductivity of the material is 80W/m K. The temperature at an interior point of the wall 24 cm distant from the outer wall is :
    (A) 43°C                  (B) 41°C
    (C) 35°C                  (D) None of these

31. Two circular discs of diameter 20 cm each are placed 2 m apart. Their emissivities are 0.3 and 0.5 . The equivalent emissivity of the system is :
    (A) 0.15                  (B) 0.8
    (C) 0.1875             (D) 0.2

32. When the compressor work input of gas turbine is reduced
    (A) Gross work output is increased      (B) Gross work output is decreased
    (C) Net work output is decreased       (D) Work ratio is increased

33. In a counter flow heat exchanger, 10000 kg/h of an oil having a specific heat of 2090 J/kgK is cooled from 82°C to 50°C by 8000 kg/h of water entering at 25°C. What is the exit temperature of the water(assume Cp of water as 4180 J/kgK?
    (A) 40°C                  (B) 45°C
    (C) 42.25°C            (D) None of these

34. Select the wrong statement from the following :
    (A) A part of liquid refrigerant evaporates during expansion in a vapour compression refrigeration system
    (B) An electrolux refrigerator is a vapour absorption refrigeration system without any pump
    (C) In aqua ammonia vapour absorption refrigeration system, incomplete rectification leads to accumulation of water in condenser
    (D) In a Lithium bromide refrigeration system, water is used as the absorbent

35. A refrigeration system operates on the reversed Carnot cycle. The higher temperature of the refrigerant is 27°C and lower temperature is –3°C. The capacity is 2TR. The power required to run the refrigeration system in kW is :
    (A) 0.222               (B) 0.778
    (C) 0.7                   (D) None of these

36. A room of 100 m³ volume is occupied by an air water mixture at 38°C. The atmospheric pressure is 1 bar and relative humidity is 70%. The saturation pressure of vapour corresponding to 38°C is 0.066 bar. The partial pressure of water vapour is :
    (A) 0.0462 bar         (B) 0.0942 bar
    (C) 0.066 bar          (D) None of these

**37.** Select the correct statement from the following :
- (A) Locomotive boiler is a water tube boiler
- (B) Cornish boiler is a single tube boiler
- (C) For a given power, water tube boilers occupy more floor area
- (D) A fire tube boiler has a higher rate of steam production

**38.** Which of the following is not a commonly used boiler mounting?
- (A) Pressure gauge
- (B) Feed check valve
- (C) Feed pump
- (D) Blow-off cock

**39.** The condition of stability of a floating body in terms of I (moment of inertia), Vs (submerged volume), and GB (distance between the centre of gravity and the centre of buoyancy) is :
- (A) $\dfrac{I}{Vs} = GB$
- (B) $\dfrac{I}{Vs} > GB$
- (C) $\dfrac{I}{Vs} < GB$
- (D) $\dfrac{I}{Vs} \neq GB$

**40.** As temperature of the liquid increases, the NPSHA (Net Positive Suction Head Available) at the inlet of centrifugal pump :
- (A) decreases
- (B) increases
- (C) remains constant
- (D) fluctuates rapidly

**41.** If there is a 1% error in measuring head over the apex of a rectangular notch (H) , the error which occurs in the discharge is :
- (A) 0.66%
- (B) 1%
- (C) 1.33 %
- (D) 1.5%

**42.** Darcy's fraction factor is :
- (A) proportional to Chezy's coefficient
- (B) inversely proportional to Chezy's coefficient
- (C) proportional to square of Chezy's coefficient
- (D) inversely proportional to square of Chezy's coefficient

**43.** Blood is an example of :
- (A) Dilatant fluid
- (B) Thixotropic fluid
- (C) Pseudo plastic fluid
- (D) None

**44.** A turbine develops 7000 kw under a head of 20 m at 140 rpm, the turbine is a :
- (A) Kaplan turbine
- (B) Francis turbine
- (C) Jonval turbine
- (D) Bulb turbine

**45.** The head against which a centrifugal pump has to work is known as :
- (A) Euler head
- (B) Total head
- (C) Manometric head
- (D) Dynamic head

**46.** A jet of water of diameter 1 cm moving with a velocity of 25 m/s strikes a hinged square plate (uniform thickness) of weight 98 N at its centre. The angle through which the plate will swing is :

    (A)    20°                               (B)    30°

    (C)    45°                                (D)    60°

**47.** A circular tank of diameter 2 m contains water upto a height of 4 m. The tank is provided with an orifice of 20 cm at the bottom. The time taken by water to completely empty the tank is approximately (cd = 0.6) :

    (A)    75 s                               (B)    100 s

    (C)    150 s                              (D)    200 s

**48.** The diameter of the jet of a pelton wheel is 90 mm and the diameter of the runner is 1.08 m. The number of buckets is given by :

    (A)    15                                  (B)    17

    (C)    19                                  (D)    21

**49.** A Pelton wheel turbine operates under a head of 250 m at a speed of 1400 rpm. To operate very close to the maximum efficiency, the mean diameter of the Pelton wheel is nearly :

    (A)    26                                  (B)    32

    (C)    48                                  (D)    62

**50.** The degree of reaction of a Kaplan turbine is :

    (A)    0                                  (B)    between 0 and 0.5

    (C)    between 0.5 and 1            (D)    1

**51.** The close pack sequence of ABAB is found in ——————— crystalline arrangement.

    (A)    FCC                             (B)    BCC

    (C)    HCP                            (D)    None of the above

**52.** Which of the following is NOT denoted by <211> as per the conventions of miller indices?

    (A)    $[2\,1\,\bar{1}]$                         (B)    $[121]$

    (C)    $[\bar{2}\,\bar{1}\,\bar{1}]$                    (D)    None of the above

**53.** The miller indices of a plane is given by (210). The intercepts of the plane with the 3 coordinate axes are :

    (A)    2, 1, 0                          (B)    1, 2, 0

    (C)    $\frac{1}{2}$, 1, 0                     (D)    None of the above

**54.** Hume Rothery rule for extensive substitutional solid solubility states that the electronegativity values of solvent and solute be :

    (A)    negative                       (B)    positive

    (C)    close                            (D)    one negative and other positive

**55.** Like bonds are preferred when enthalpy of mixing is :
    (A)   positive                 (B)   negative
    (C)   zero                     (D)   decreasing

**56.** Statement 1 : The Burger's vector of a screw dislocation is always perpendicular to the dislocation line.
    Statement 2 : There is no uniquely defined slip plane for a screw dislocation.
    (A)   Both Statements are true
    (B)   Both Statements are false
    (C)   Statement 1 is true, Statement 2 is false
    (D)   Statement 1 is false, Statement 2 is true

**57.** When 3 phases coexist in a binary phase diagram the degree/s of freedom become/s :
    (A)   0                     (B)   1
    (C)   2                     (D)   3

**58.** Statement 1 : Eutectic reaction occurs when the melting points of the two components involved are far apart.
    Statement 2 : Peritectoid reaction involves only solid phases.
    (A)   Both Statements are true
    (B)   Both Statements are false
    (C)   Statement 1 is true, Statement 2 is false
    (D)   Statement 1 is false, Statement 2 is true

**59.** Which of the following statements is true regarding Fick's Laws of diffusion?
    (A)   Fick's first law applies to time dependent concentration changes
    (B)   Fick's second law applies to steady-state diffusion
    (C)   Fick's first law describes the diffusion flux as proportional to the concentration gradient
    (D)   Fick's second law is not related to concentration profiles

**60.** In a TTT diagram, shifting the nose to the left by alloying :
    (A)   does not affect hardenability
    (B)   increases hardenability
    (C)   decreases hardenability
    (D)   Hardenability depends on alloying elements added

**61.** Statement 1 : Brass is alloy formed of copper and tin
    Statement 2 : Brass is alloy of copper and zinc
    (A)   Both Statements are true
    (B)   Both Statements are false
    (C)   Statement 1 is true, Statement 2 is false
    (D)   Statement 1 is false, Statement 2 is true

**62.** During which heat treatment process is steel heated to a temperature above its critical range and then 'slow cooled' in air?

(A) Annealing
(B) Normalizing
(C) Tempering
(D) All of the above

**63.** A ball and socket joint forms :

(A) sliding pair
(B) turning pair
(C) rolling pair
(D) spherical pair

**64.** Effective tension on tight side is 1000 N and slack side is 500 N, linear velocity is 20 m/sec. The power transmitted for belt drive is :

(A) 1 kW
(B) 10 kW
(C) 20 kW
(D) 30 kW

**65.** Dynamometer is a device, which is used to measure :

(A) speed of machine
(B) rpm of machine
(C) weight of the machine
(D) power developed by the machine

**66.** The type of gears used to connect two non-parallel non-intersecting shafts are :

(A) straight spur gears
(B) straight bevel gears
(C) cross helical gears
(D) spiral gears

**67.** In a gear trains where the axes of gears have motion are called :

(A) bevel wheel gear trains
(B) epicyclic gear trains
(C) reverted gear trains
(D) compound gear trains

**68.** Governor power is defined as :

(A) product of governor effort and sleeve lift
(B) governor effort divided by sleeve lift
(C) product of governor effort and difference of radii of rotation for maximum and minimum speed
(D) none of the above

**69.** In an automobile, if the vehicle makes a left turn, the gyroscopic torque :

(A) increases the forces on the outer wheel
(B) decreases the forces on the outer wheel
(C) does not affect the forces on the outer wheel
(D) first decrease and then increase the forces on the outer wheel

**70.** Longitudinal vibrations are said to occur when the particles of a body move :

(A) perpendicular to its axis
(B) parallel to its axis
(C) inclined at 45° to its axis
(D) in a circle about its axis

71. The whirling speed of a rotating shaft carrying a mass $m$ at the centre is :
    (A) more than the natural frequency of transverse vibration of the system
    (B) less than the natural frequency of transverse vibration of the system
    (C) is equal to natural frequency of transverse vibration of the system
    (D) is more or less depending upon the stiffness of the shaft

72. Which of the following is not a theory of elastic failure?
    (A) maximum principal stress theory      (B) maximum shear stress theory
    (C) maximum energy theory                (D) distortion energy theory

73. Which of the following is not a desirable property for shaft material?
    (A) good wear resistance                 (B) good machinability
    (C) high strength                        (D) high notch sensitivity

74. The distance on the pitch circle from a point on a tooth to the corresponding point on the adjacent tooth is :
    (A) face width                           (B) diametral pitch
    (C) circular pitch                       (D) module

75. The rating life for ball bearing is :
    (A) directly proportional to the equivalent load
    (B) inversely proportional to the equivalent load
    (C) directly proportional to the cube of equivalent load
    (D) inversely proportional to the cube of equivalent load

76. Single plate clutches are used in :
    (A) buses                                (B) three wheelers
    (C) scooters                             (D) mopeds

77. In casting, what is the primary function of a riser?
    (A) To allow gases to escape
    (B) To provide a reservoir for molten metal
    (C) To shape the final product
    (D) To support the mould

78. Which welding process uses a non-consumable tungsten electrode :
    (A) MIG welding                          (B) TIG welding
    (C) SMAW                                 (D) Oxy-acetylene welding

79. Which of the following is NOT a yield criterion?
    (A) Von Mises                            (B) Tresca
    (C) Mohr-Coulomb                         (D) Bernoulli

**80.** Tool wear is influenced by which factor?
    (A) Cutting speed              (B) Workpiece material
    (C) Tool material              (D) All of the above

**81.** In CNC programming, which code represents a rapid traverse motion?
    (A) G00                       (B) G01
    (C) M03                       (D) M06

**82.** Which type of machine tool hold multiple tools?
    (A) Milling machine           (B) Turret lathe
    (C) Shaper                  (D) Drill press

**83.** Which of the following processes uses electrical discharge to machine hard metals?
    (A) EDM                    (B) ECM
    (C) USM                    (D) AJM

**84.** Which non-traditional machining process uses a high-velocity jet of water mixed with abrasive particles?
    (A) EDM                    (B) LBM
    (C) AJM                    (D) AWJM

**85.** What does a coordinate measuring machine (CMM) primarily measure?
    (A) Surface roughness       (B) Dimensional accuracy
    (C) Hardness               (D) Electrical conductivity

**86.** Which method uses light interference to measure very small distances or surface irregularities?
    (A) Interferometry          (B) Comparator
    (C) Profilometry             (D) Micrometry

**87.** Which software is typically used for creating detailed engineering drawings and models?
    (A) MATLAB               (B) CAD
    (C) SPSS                   (D) AutoLISP

**88.** Which tool material is most suitable for high-speed machining of tough alloys?
    (A) High-speed steel (HSS)    (B) Carbon steel
    (C) Tungsten carbide       (D) Cast iron

**89.** A Public limited company is a type of :
    (A) Joint stock company     (B) Proprietary company
    (C) Partnership company    (D) None of the above

**90.** The number of subordinates a superior can manage effectively is :
    (A) Optimum control       (B) Span of control
    (C) Effective control       (D) Control number

**91.** Functional layout is also called :
  (A) Group layout        (B) Product layout
  (C) Line layout        (D) Process layout

**92.** The crane which is provided with wheels and can be moved from one place to another as per requirement is called :
  (A) Jib crane        (B) Pillar crane
  (C) Gantry crane        (D) Bridge crane

**93.** The diagram to study the extent of traffic over different routes of the plant is :
  (A) String diagram        (B) Plant diagram
  (C) Process diagram        (D) None of the above

**94.** The function that executes production planning is :
  (A) Scheduling        (B) Loading
  (C) Dispatching        (D) Routing

**95.** In inventory model cost of capital is a component of :
  (A) Ordering cost        (B) Carrying cost
  (C) Shortage cost        (D) None of the above

**96.** Whenever subgroup size is variable the attribute control chart used is :
  (A) R chart        (B) C chart
  (C) np chart        (D) p chart

**97.** If two components each with reliability 0.9 are connected in parallel, the system reliability is :
  (A) 0.81        (B) 0.99
  (C) 0.97        (D) 0.89

**98.** The process of attracting top talented people to an organization is :
  (A) Recruitment        (B) Selection
  (C) Interview        (D) None of the above

**99.** In simplex method for solving linear programming problem, the variable which is adding to a $\le$ constraint is called :
  (A) Feasible variable        (B) Decision variable
  (C) Surplus variable        (D) Slack variable

**100.** The project management technique evolved through research and development projects is :
  (A) Critical Path Method
  (B) Project Evaluation and Review Technique
  (C) Program Evaluation and Review Technique
  (D) None of the above

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