

1. The free body diagram of a body is a diagram showing
 - A) All the forces, including the reactions at the supports or surfaces
 - B) The forces, but not showing the reactions at the supports or surfaces
 - C) All the forces and the supports or surfaces
 - D) Only the reactions at the supports or surfaces of the body
2. If the number of nodes in a perfect frame is n , then the number of members is
 - A) $2n-1$
 - B) $2n$
 - C) $2n-3$
 - D) $n-1$
3. The angular momentum of a body of mass m rotating about an axis with angular velocity ω and at radius r is
 - A) $m\omega r$
 - B) $m\omega r^2$
 - C) $m\omega$
 - D) $m\omega^2 r$
4. "The algebraic sum of the moments of any two forces about any point in their plane is equal to the moment of their resultant about the same point." This statement is the
 - A) Lami's Theorem
 - B) Law of polygon of forces
 - C) Principle of moments
 - D) Varignon's theorem
5. If the resultant of two equal forces has the same magnitude, then the angle between them is
 - A) 120°
 - B) 30°
 - C) 60°
 - D) 90°
6. A particle starts from rest with a constant acceleration α m/s^2 and after some time it decelerates at a uniform rate of β m/s^2 till it comes to rest. If the total time taken between two rest positions is t , the maximum velocity acquired by the particle is
 - A) $(\alpha+\beta) t/2$
 - B) $(\alpha-\beta) t/2$
 - C) $(\alpha\beta t)/(\alpha+\beta)$
 - D) $(\alpha+\beta) t/(\alpha-\beta)$
7. A perfectly elastic ball moving with a velocity 10 m/s impinges directly another perfectly elastic ball of same mass moving in opposite direction with a velocity 20m/s. The velocity of the first ball after impact will be
 - A) 15 m/s
 - B) 20 m/s
 - C) 10 m/s
 - D) 14.14 m/s
8. If Poisson's ratio is 0.25, then the modulus of rigidity (G) and the modulus of elasticity (E) are related as
 - A) $G= 0.33 E$
 - B) $G= 0.5 E$
 - C) $G= 0.4 E$
 - D) $G= 0.25 E$
9. The thermal stress in terms of coefficient of linear expansion (α), rise in temperature (ΔT) and the modulus of elasticity (E) is given by
 - A) $E\alpha/\Delta T$
 - B) $1/(E\alpha\Delta T)$
 - C) $E\Delta T/\alpha$
 - D) $E\alpha\Delta T$

10. The longitudinal stress within cylindrical shell of diameter (D), length (L) and thickness (t), when subjected to an internal pressure (P) is
 A) $PD/(4t)$ B) $PD/(2t)$ C) $2PD/t$ D) $4PD/t$
11. The buckling load will be maximum for a column, if
 A) One end of the column is fixed and other end is hinged
 B) Both ends are fixed
 C) One end is fixed and other end is free
 D) Both ends are hinged
12. A cantilever of length l carries a uniformly distributed load for a distance a ($a < l$) from the free end. The shear force diagram will be
 A) A rectangle B) A triangle
 C) A trapezium D) A parabola
13. If a solid shaft can resist a bending moment of 3 kN-m and a twisting moment of 4 kN-m together, then the maximum torque that can be applied is
 A) 5 kN-m B) 7 kN-m
 C) 4.5 kN-m D) 6 kN-m
14. The instantaneous centre of a link which rolls without slipping upon another fixed link is located at
 A) The centre of the rolling link
 B) The point of contact
 C) The point on the circumference seated vertically opposite to the contact point
 D) An infinite distance on the plane surface
15. The velocity of any point on the link with respect to another point on the same link is
 A) Product of angular velocity of the link and the distance between the points
 B) Zero
 C) Product of angular velocity of the link and the square of distance between the points
 D) Product of square of angular velocity of the link and the distance between the points
16. A slider sliding at 10 cm/s on a link, which is rotating at 60 rpm. The Coriolis acceleration of the slider is
 A) 40 cm/s^2 B) $0.4\pi \text{ cm/s}^2$
 C) $40\pi \text{ cm/s}^2$ D) 20 cm/s^2
17. The velocity and acceleration of the piston at inner dead centre in slider-crank mechanism with crank radius r and crank speed ω will be respectively
 A) 0 and 0 B) 0 and $\omega^2 r$
 C) 0 and $<\omega^2 r$ D) 0 and $>\omega^2 r$

18. When the axes of the driver and driven shafts are co-axial, the compound gear train is known as
 A) Simple gear train B) Differential gear train
 C) Reverted gear train D) Epicyclic gear train
19. In a flywheel, the maximum fluctuation of energy is
 A) The difference between the maximum and minimum energies
 B) The sum of the maximum and minimum energies
 C) The ratio of the maximum energy to minimum energy
 D) The ratio of the minimum energy to maximum energy
20. The piston effort for a vertical engine includes
 A) Pressure force due to gas and inertia force
 B) Pressure force due to gas, inertia force and frictional resistance
 C) Pressure force due to gas, inertia force and weight of the piston
 D) Pressure force due to gas, inertia force, weight of the piston and frictional resistance
21. In a spring mass system, the mass of the system is doubled and the spring stiffness is made half. The natural frequency of vibration is
 A) Halved B) Doubled
 C) Unaffected D) Quadrupled
22. The torsional stiffness of a circular shaft is
 A) Directly proportional to its length
 B) Independent of its length
 C) Inversely proportional to its length
 D) Proportional to square of its length
23. Resonance is a phenomenon where frequency of exciting force is ----- the natural frequency of the system
 A) double B) half C) equal to D) thrice
24. A shaft has two heavy rotors mounted on it. The shaft has ----- critical speed(s).
 A) one B) two C) four D) eight
25. The particles of a body vibrate along a circular arc, whose centre lies in the axis of the body. The type of vibration is then
 A) Torsional vibration B) Longitudinal vibration
 C) Transverse vibration D) Lateral vibration
26. The type of damping due to sliding of two dry surfaces is termed as
 A) Viscous damping B) Coulomb damping
 C) Structural damping D) Interfacial damping

27. The theoretical stress concentration factor for a plate with a circular hole under tension is
 A) 1.5 B) 2.0 C) 2.5 D) 3.0
28. The factor of safety for fatigue loading is the ratio of
 A) Elastic limit to the working stress
 B) Young's modulus to the ultimate strength
 C) Endurance limit to the working stress
 D) Elastic limit to linear deformation
29. In order to reduce thermal stress, fastening bolts must be made of materials possessing
 A) High coefficient of linear expansion
 B) Low coefficient of linear expansion
 C) Zero coefficient of linear expansion
 D) Negative coefficient of linear expansion
30. Which theory of failure states that the failure may occur when the maximum principal stress is equal to the elastic limit in tension?
 A) Von Mises theory B) Guest's theory
 C) Rankine's theory D) St Venant's theory
31. An axle is subjected to
 A) Bending only B) Direct load only
 C) Torsion only D) Bending and torsion
32. A multi-disc clutch has three discs on the driving shaft and two discs on the driven shaft. The number of pairs of contact surfaces is
 A) 2 B) 3 C) 4 D) 5
33. The life of a ball bearing at a load of 1kN is 27000 hours. Its life in hours, if the load is increased to 3 kN, keeping all the other conditions same is
 A) 9000 B) 1000 C) 3000 D) 5000
34. No axial thrust is experienced in
 A) Helical gears B) Bevel gears
 C) Spiral gears D) Herringbone gears
35. The dimension of kinematic viscosity in terms of the dimension of mass M, length L and time T is
 A) $ML^{-1}T^{-1}$ B) $ML^{-1}T^{-2}$ C) L^2T^{-1} D) LT^{-2}
36. A body in floatation at the free surface of a fluid is stable if
 A) The metacentre is above the CG of the body
 B) The metacentre is below CG of the body
 C) The CG is below the centre of buoyancy
 D) The CG coincides with the metacentre


37. An inverted U tube manometer is used
 A) To measure large pressure difference
 B) When the specific weight of manometric fluid is less than the specific weight of flowing fluid
 C) To measure pressure at a point in a flowing fluid
 D) To measure the dynamic pressure of a moving stream of fluid
38. Each term of the Bernoulli's equation stated in the form $P + wz + \rho V^2/2 = \text{constant}$ has units of total energy per unit
 A) Mass B) Weight C) Area D) Volume
39. The Reynolds's number for flow of fluid in a circular tube is 4000. If the diameter of the tube is increased by 25% and the fluid velocity is decreased by 20%, the Reynolds's number for the same fluid will be
 A) 4000 B) 4200 C) 3800 D) 3000
40. The ratio of maximum velocity to average velocity of a fully developed laminar viscous flow through a circular tube is
 A) 1.732 B) 1.414 C) 2.0 D) 3.0
41. The predominant forces acting on an element of fluid in the boundary layer over a flat plate placed in a uniform flow are
 A) Inertia and pressure forces B) Viscous and pressure forces
 C) Viscous and body forces D) Viscous and inertia forces
42. Which of the following is the best thermal insulator material?
 A) Saw dust B) Glass wool
 C) Cork D) Asbestos sheet
43. A composite wall has two layers of different materials with thermal conductivity k_1 and k_2 . If each layer has same thickness, the equivalent thermal conductivity will be
 A) $k_1 k_2$ B) $k_1 + k_2$
 C) $(k_1 + k_2)/(k_1 k_2)$ D) $2k_1 k_2/(k_1 + k_2)$
44. The dimensionless quantity used in transient heat conduction is
 A) Grashoff number B) Lewis number
 C) Biot number D) Schmidt number
45. An aluminium ($k= 240 \text{ W/mK}$) electric cable of diameter 5 mm is to be insulated with a material of $k=0.04 \text{ W/mK}$. If the cable is located in air ($h=10 \text{ W/m}^2\text{K}$), the optimum thickness of insulation will be
 A) 1.5 mm B) 8 mm
 C) 3 mm D) 4 mm

46. Which of the following statements about fins is wrong?
- A) Fin effectiveness is high with a material of high thermal conductivity.
 - B) Use of thin, but closely spaced fins is preferred in most engineering applications.
 - C) Use of fins can be better justified under conditions for which the convection coefficient is large.
 - D) The need for fin is stronger when the surface heat transfer is by free convection.
47. The Prandtl number is the ratio of
- A) The momentum and mass diffusivities
 - B) The momentum and thermal diffusivities
 - C) The thermal and mass diffusivities
 - D) The inertia and viscous forces
48. The rate at which radiation is emitted per unit area at all possible wavelengths and in all possible directions is the
- A) Total emissive power
 - B) Monochromatic emissive power
 - C) Radiosity
 - D) Irradiation
49. A body whose reflectivity is unity is called a
- A) White body
 - B) Black body
 - C) Transparent body
 - D) Gray body
50. If velocity of water inside a smooth tube is doubled, the turbulent flow heat transfer coefficient between the water and the tube wall
- A) Remains unchanged
 - B) Increases to double its value
 - C) Increases but will not reach double its value
 - D) Increases to more than double its value
51. A cross flow heat exchanger has an area of 50m^2 . The overall heat transfer coefficient is $100\text{ W/m}^2\text{K}$ and heat capacity of both hot and cold fluids is 1000 W/K . The value of NTU is then
- A) 1000
 - B) 100
 - C) 5
 - D) 0.2
52. Which of the following sets have all intensive properties?
- A) Pressure, temperature, density, specific volume
 - B) Pressure, volume, energy, specific volume
 - C) Pressure, energy, volume, density
 - D) Pressure, heat, density, specific volume
53. If a refrigerator is operated with the door open in an isolated room, then the temperature of the room
- A) Decreases
 - B) Remains constant
 - C) Increases
 - D) Decreases and then remains constant

54. The change in entropy of the universe, when any irreversible process takes place is
 A) Positive B) Zero C) Negative D) Unity
55. A system is working between 800 K and 400 K. If the heat supplied to the system is 200 kJ, then the unavailable energy is
 A) 150 kJ B) 125 kJ C) 75 kJ D) 100 kJ
56. A state of a pure substance at which a phase change ends or begins is called
 A) Critical state B) Saturated state
 C) Triple point D) Gibb's state
57. In an isothermal process of a system, its internal energy
 A) Always increases B) Always decreases
 C) Is zero D) Remains constant
58. A Carnot cycle has two isentropic and two ----- processes.
 A) isochoric B) isothermal
 C) isobaric D) polytropic
59. In regenerative Rankine's cycle
 A) Feed water is heated with the help of steam
 B) The steam is extracted at a suitable point in a turbine and is reheated
 C) The steam is heated after expansion in the turbine
 D) The steam is heated before entering the turbine
60. In a psychrometric chart sensible heating or cooling is represented by
 A) Vertical line B) Horizontal line
 C) Inclined line D) Curved lines
61. The Francis turbine is suited for
 A) High head and low discharge B) High head and high discharge
 C) Low head and low discharge D) Medium head and medium discharge
62. In Otto cycle heat addition is assumed to be at constant
 A) Pressure B) Volume
 C) Temperature D) Enthalpy
63. The impulse turbine among the following is
 A) Pelton wheel B) Francis turbine
 C) Kaplan turbine D) Propeller turbine
64. The crystal structure of gamma iron is
 A) Simple cubic B) BCC C) FCC D) HCP

65. Increasing temperature has the following effect on stress-strain curves
- A) It raises ductility
 - B) It lowers toughness
 - C) It raises the yield stress
 - D) The sensitivity of strength to strain rate decreases
66. Non ferrous alloys and stainless steels are heat treated by a process called
- A) Annealing
 - B) Quenching
 - C) Tempering
 - D) Precipitation hardening
67. The thermoplastics among the following is
- A) Acrylics
 - B) Phenolics
 - C) Polyester
 - D) Polyamides
68. Which of the following metal expands during solidification of casting?
- A) Aluminium
 - B) Copper
 - C) Gray cast iron
 - D) Zinc
69. The solidification time of a casting is
- A) Proportional to volume and inversely proportional to surface area
 - B) Proportional to square of volume and inversely proportional to square of surface area
 - C) Proportional to square of volume and inversely proportional to surface area
 - D) Proportional to volume and inversely proportional to square of surface area
70. Riser in a mould should be located in such a way so that
- A) It is first to receive molten metal
 - B) It is last to solidify
 - C) It is first to solidify
 - D) It is not to receive molten metal
71. Which casting method is limited to non ferrous metals?
- A) Sand casting
 - B) Shell mould casting
 - C) Plaster mould casting
 - D) centrifugal casting
72. Chills are used in casting moulds to
- A) Achieve directional solidification
 - B) Reduce possibility of blow holes
 - C) Increase surface finish
 - D) Reduce the solidification time
73. Mannesmann process is a
- A) Casting process
 - B) Rolling process
 - C) Forging process
 - D) Machining operation

74. The forging force in impression-die forging is
 A) Proportional to the projected area of the forging
 B) Proportional to the surface area of the forging
 C) Inversely proportional to the projected area of the forging
 D) Inversely proportional to the surface area of the forging
75. Metal extrusion process is generally used for producing
 A) Uniform solid sections
 B) Uniform hollow sections
 C) Uniform solid and hollow sections
 D) Varying solid and hollow sections
76. Which of the following is not a significant problem in sheet forming?
 A) Bulging
 B) Spring back
 C) Buckling
 D) Wrinkling
77. The tiny balls for ball point pens are made by
 A) Rolling
 B) Casting
 C) Powder metallurgy
 D) Shot peening
78. Arc welding process that uses non consumable electrode is
 A) Shielded metal arc welding
 B) Submerged arc welding
 C) Electro slag welding
 D) Atomic hydrogen welding
79. The commonly used flux for brazing is
 A) Borax
 B) lead
 C) Ammonium chloride
 D) Spelter
80. An example for inorganic adhesive is
 A) Epoxy
 B) Acrylic
 C) Sodium silicate
 D) Phenolic
81. Weldability is poor for
 A) Low carbon steels
 B) medium carbon steels
 C) High carbon steels
 D) Niobium
82. Serrated chips are observed in machining
 A) Aluminium
 B) Titanium
 C) Cast iron
 D) Tungsten
83. Which tool geometry of a single point cutting tool affects surface finish?
 A) Rake angles
 B) Relief angles
 C) Cutting edge angles
 D) Nose radius

93. In 2- person zero-sum games, the value of the game is
 A) Zero B) 1
 C) -1 D) 2
94. KANBAN is a
 A) JIT concept B) FMS concept
 C) MRP concept D) GT concept
95. Routing and scheduling are integral part of
 A) Work study B) Quality control
 C) Product planning D) Job analysis
96. H7/g6 is a
 A) Transition fit B) Sliding fit
 C) Interference fit D) Force fit
97. The degree to which an instrument gives repeated measurements of the same standard is called
 A) Precision B) Accuracy
 C) Sensitivity D) Resolution
98. The type of gage used to measure holes is
 A) Snap gages B) Plug gages
 C) Ring gages D) Strain gages
99. The symbol used to represent flatness is
 A) — B) \perp
 C) // D) 
100. The instrument used to accurately measure small angular deviations on a flat surface is
 A) Staright edge B) Dial indicator
 C) Auto collimator D) Optical flat
