

1. The deformation rates as high as following are used in high velocity forming of metals:
A. 2 m/s
B. 25 m/s
C. 250 m/s
D. 500 m/s
2. Explosive forming is used for following :
A. Only for electrical insulators
B. For large parts typical of aerospace industry
C. Making very small complex parts
D. None of the above
3. The following is not true for Jigs and Fixtures :
A. Rapid production
B. Automatic location
C. Lesser manufacturing cost
D. Higher speeds cannot be used
4. In order to locate a rectangular block in a jig or fixture accurately the following number of movements must be restricted:
A. 3
B. 6
C. 9 Limit Gauge
D. 12
5. Limit Gauge
A. checks whether the part is made within the specified limit
B. measures the value of the upper specification limit
C. measures the value of the lower specification limit
D. measures both upper and lower specification limits
6. The following is not the characteristic of explosive forming :
A. Low capital cost of the set up
B. Very large components can be formed
C. Only a single die is required
D. The tooling material is very expensive
7. The following is not a characteristic of optical comparator :
A. High magnification
B. Very few moving linkages
C. Cheap
D. Optical lever is weightless
8. Diamond pin location is used in fixture because
A. It does not wear out.
B. It takes care of any variation in centre distance between two holes.
C. It is easy to clamp the part on the diamond tips.
D. It is easy to manufacture.
9. In deep drawing the drawing force (neglecting the friction between the job and the die wali) is approximately equal to
A. $2 \pi r_p t$
B. $3 \pi r_p t$
C. $4 \pi r_p t$
D. $6 \pi r_p t$

where r_p = radius of the punch

t = sheet thickness

σ_2 = stress in the direction of drawing

10. Which of the following is not the characteristic of stress-strain curve for mild steel?
 - A. The stress is proportional to the strain up to the proportional limit.
 - B. Percentage reduction in area may be as high as 60-70 %.
 - C. A neck is formed due to high stress level.
 - D. During plastic stage no strain hardening takes place.
11. Micro-geometrical deviations of surface roughness are a series of repeated deviations of a wave with a ratio of pitch to height approximately equal to
 - A. 50
 - B. 100
 - C. 500
 - D. 1000
12. The tool life is affected by which of the following ?
 - A. Depth of cut
 - B. Cutting speed
 - C. Feed
 - D. All of the above
13. For efficient cutting of material with Laser Beam Machining, the material must be
 - A. good conductor of electricity
 - B. bad conductor of heat
 - C. good conductor of heat
 - D. good conductor of heat and electricity
14. Following electrolyte is used in electro-chemical machining process :
 - A. kerosene
 - B. transformer oil
 - C. brine solution
 - D. water
15. Discontinuous chips are formed during machining of which of the following materials ?
 - A. brittle metals
 - B. ductile metals
 - C. soft metals
 - D. hard metals
16. If the cutting speed is increased, what will happen to the built-up edge?
 - A. It becomes longer
 - B. It becomes smaller and may vanish later
 - C. It does not form
 - D. Has no relation to speed
17. The angle made by the tool face with a plane parallel to cutting tool base is known as
 - A. rake angle
 - B. cutting angle
 - C. clearance angle
 - D. lip angle
18. Crater wear occurs due to which one of the following phenomenon ?
 - A. Adhesion
 - B. Diffusion
 - C. Oxidation
 - D. All of the above
19. How many elements define the tool signature ?
 - A. Two
 - B. Four
 - C. Five
 - D. Seven
20. With high speed steel tools, the maximum safe operating temperature is of the order of
 - A. 200°C
 - B. 540°C
 - C. 760°C
 - D. 870°C
21. The following is true for "GO" and "NO GO" gauges :
 - A. Plug gauge can measure the dimension of a hole.
 - B. Wear allowance is provided on "NO GO" end.
 - C. "GO" end is smaller than "NO GO" end.
 - D. Gauge tolerance is 10 % of manufacturing tolerance.

22. The hot forging of steel specimen is carried out at a temperature of
 A. 400°C
 B. 600°C
 C. 500°C
 D. 950°C
23. The relationship between the shear angle ϕ , friction angle β , and cutting rake angle α , and the machining constant C for the work material is
 A. $2\phi + \beta - \alpha = C$
 B. $2\alpha + \beta - \phi = C$
 C. $2\beta + \alpha - \phi = C$
 D. $2\phi + \alpha + \beta = C$
24. Flank wear occurs mainly on the
 A. nose part of the cutting tool
 B. front relief face and side relief face of the cutting tool
 C. face of cutting tool at a short distance from the cutting edge
 D. both A. and B. above
25. If r = chip thickness ratio, α = rake angle then shear angle ϕ is expressed as
 A. $\tan^{-1} \frac{r \cos \alpha}{1 - r \sin \alpha}$
 B. $\cot^{-1} \frac{r \cos \alpha}{1 - r \sin \alpha}$
 C. $\sin^{-1} \frac{r \cos \alpha}{1 - r \sin \alpha}$
 D. $\cos^{-1} \frac{r \cos \alpha}{1 - r \sin \alpha}$
26. Taylor's tool life equation is as follows:
 A. $TV^n = C$
 B. $VT^{\frac{1}{n}} = C$
 C. $VT^n = C$
 D. $(VT)^{\frac{1}{n}} = C$
27. In metal cutting, Merchant's circle gives the relationship among various components of
 A. stresses
 B. strains
 C. forces
 D. velocities
28. Chip velocity in machining of metals is equal to
 A. rV
 B. rV_s
 C. $\frac{V}{r}$
 D. $\frac{V_s}{r}$

Where V = cutting velocity

V_s = velocity along the shear plane

r = chip thickness ratio

29. The shear angle derived on the basis of minimisation of rate of energy consumption is expressed by
 A. $\phi = \frac{\pi}{4} - \frac{1}{2}(\beta - \alpha)$
 B. $\phi = \frac{\pi}{2} - \frac{1}{2}(\beta - \alpha)$
 C. $\phi = \frac{\pi}{4} - \frac{1}{2}(\alpha - \beta)$
 D. $\phi = \frac{\pi}{2} - \frac{1}{2}(\alpha - \beta)$

Where ϕ = shear angle

α = rake angle

β = friction angle

- 30. In a single point turning operation of steel with a cemented carbide tool, Taylor's tool life exponent is 0.25. If the cutting speed is halved, the tool life will increase by
 - A. two times
 - B. four times
 - C. eight times
 - D. sixteen times
- 31. In EDM the tool is made of
 - A. High Speed Steel
 - B. Cast Iron
 - C. Copper
 - D. Plain Carbon Steel
- 32. The tool material used in USM is
 - A. Mild Steel
 - B. High Speed Steel
 - C. Carbides
 - D. Ceramics
- 33. The current used during EDM is
 - A. AC
 - B. pulsed AC
 - C. DC
 - D. pulsed DC
- 34. In ultrasonic machining the tool is vibrated with the following frequency:
 - A. 50 Hz
 - B. 1500 Hz
 - C. 10,000 Hz
 - D. 20,000 Hz
- 35. The following is not true for Jigs :
 - A. These are used on drilling operation.
 - B. These guide the tools.
 - C. These hold the components.
 - D. Increased machining accuracy.
- 36. The value of surface roughness 'h' obtained during the turning operation at a feed 'f' with a round nose tool having radius 'r' is given by
 - A. $f^2/4r$
 - B. $f^2/8r$
 - C. $f^2/12r$
 - D. $f^2/16r$
- 37. The following is not true for the tool life equation :
 - A. The smaller the value of 'n' steeper the slope of log V-log T line.
 - B. For ideal tool material n = 1.
 - C. The larger the value of C smaller is the tool life.
 - D. The range of variation of n for HSS is 0.08-0.20.
- 38. In USM process the material removal rate is higher for materials with
 - A. higher toughness
 - B. higher ductility
 - C. higher fracture strain
 - D. lower toughness
- 39. The mechanism of metal removal in Electron Beam Machining is
 - A. melting and vapourization
 - B. shear
 - C. ion-displacement
 - D. chemical action
- 40. Which one of the following is most important for EDM ?
 - A. thermal capacity
 - B. hardness
 - C. strength
 - D. geometry

41. Heat treatment is done to
A. change grain size and soften the metal
B. improve electrical and magnetic properties
C. relieve internal stresses
D. all of the above
42. Ferrites are sub-group of
A. ferromagnetic material
B. ferrimagnetic material
C. diamagnetic material
D. paramagnetic material
43. The capacity of a material to undergo deformation under tension without rupture is
A. mechanical strength
B. stiffness
C. toughness
D. ductility
44. Hooke's Law holds good upto
A. proportional limit
B. yield point
C. elastic limit
D. plastic limit
45. An example of amorphous material is
A. lead
B. silver
C. glass
D. brass
46. The atomic packing factor of B.C.C. metal is
A. 0.96
B. 0.68
C. 0.74
D. 0.52
47. How many atoms are present in a unit cell of a body centred cubic space lattice ?
A. Six
B. Nine
C. Fourteen
D. Twenty four
48. Nickel is mostly found in
A. Russia
B. Canada
C. Russia and Canada
D. Russia and India
49. Slow and progressive deformation of a material with time under constant stress is called
A. creep
B. erosion
C. resilience
D. fatigue
50. Which of the following metals has the lowest specific gravity?
A. Monal metal
B. Copper
C. Magnesium
D. Bronze
51. The electrical conductivity of semi-conductor is of the order of
A. 10^{-3} mho cm^{-1}
B. 10^{-6} mho cm^{-1}
C. 10^{-8} mho cm^{-1}
D. 10^3 mho cm^{-1}
52. In a dielectric, the power loss is proportional to
A. w
B. w^2
C. $1/w$
D. $1/w^2$

53. Dielectric materials are used primarily for
A. insulation
B. charge storage
C. reducing electric loss
D. none of these
54. By doping, electrical conductivity of a semi-conductor
A. decreases
B. increases
C. remains unaffected
D. none of the above
55. The resistance to fatigue of a material is measured by
A. elastic limit
B. Young's modulus
C. ultimate tensile strength
D. endurance limit
56. A body having same properties throughout its volume is said to be
A. isotropic
B. continuous
C. homogeneous
D. uniform
57. The materials which exhibit the same elastic properties in all directions are called
A. isotropic
B. homogeneous
C. perfectly elastic
D. anisotropic
58. Energy of a photon is
A. $h\nu$
B. $h \cdot \lambda$
C. $1/h\nu$
D. $\nu \cdot \lambda$
59. Very high strength in Aluminium alloys is obtained by
A. precipitation hardening
B. solid solution hardening
C. cold working
D. annealing
60. Closed packed planes are formed in
A. simple cubic crystals
B. body centered cubic crystals
C. diamond cubic crystals
D. face centered cubic crystals
61. A material in superconducting state is
A. paramagnetic
B. diamagnetic
C. ferromagnetic
D. anti ferromagnetic
62. The constituents which most ceramic material contain is
A. Calcium
B. Nitrate
C. Silicate
D. none of the above
63. The percentage of carbon in low carbon steel is
A. 0.15
B. 0.30
C. 0.50
D. 0.70
64. Babbit metal is
A. lead base alloy
B. tin base alloy
C. copper base alloy
D. lead and tin base alloy
65. The imperfection in the crystal structure of metal is called
A. dislocation
B. slip
C. cleavage
D. fracture

66. Zn and Mg have the following crystal structure :
- A. B.C.C.
 - B. F.C.C.
 - C. diamond cubic
 - D. H.C.P.
67. A material in which the atoms are arranged chaotically is called
- A. amorphous
 - B. mesomorphous
 - C. crystalline
 - D. none of the above
68. Which of the following material has non-linear elastic behaviour ?
- A. Mild Steel
 - B. Aluminium
 - C. Cast iron
 - D. Rubber
69. Which of the following is made of Ceramic materials ?
- A. Heating element
 - B. Spark plug
 - C. Pyrometer
 - D. Furnace linings
70. The ratio of modulus of rigidity to modulus of elasticity of a material for a Poisson's ratio of 0.25 would be
- A. 0.5
 - B. 0.4
 - C. 0.3
 - D. 0.1
71. When mechanical properties of a material remain same in a particular direction at each point, such a material is called
- A. isotropic
 - B. homogeneous
 - C. orthotropic
 - D. anisotropic
72. Vectorial sum of the Burgers vector of dislocations meeting at a nodal point is
- A. zero
 - B. 1
 - C. -1
 - D. none of the above
73. The [110] direction in a cubic unit cell is parallel to
- A. face diagonal of unit cell
 - B. edge of the cube
 - C. body diagonal of the cube
 - D. none of the above
74. A material shall be called ideal plastic material if
- A. it does not strain harden
 - B. it strain hardens
 - C. if it is made of plastic
 - D. none of the above
75. Stress concentration is caused due to
- A. variation in load acting on a member
 - B. variation in material properties
 - C. abrupt change of cross-section
 - D. none of the above
76. The following is not true for the assignment model :
- A. $x_{ij} = 1$
 - B. $\sum_{j=1}^n x_{ij} = 1$
 - C. $\sum_{i=1}^n x_{ij} = 1$
 - D. it can be stated in the form of $n \times n$ cost matrix $[C_{ij}]$ of real numbers

96. The maximum displacement of a body moving with simple harmonic motion from its mean position is called
- A. oscillation
 - B. amplitude
 - C. beat
 - D. none of the above
97. Group A items constitute the following percentage of items in ABC analysis :
- A. 10 to 20 %
 - B. 30 to 40 %
 - C. 40 to 50 %
 - D. 50 to 60 %
98. If $p = \% \text{ activity}$ and $A = \text{limit of accuracy in work sampling}$, the number of observations at A confidence level of 95 % is equal to the following :
- A. $\frac{(1-p)}{A^2p}$
 - B. $\frac{2(1-p)}{A^2p}$
 - C. $\frac{3(1-p)}{A^2p}$
 - D. $\frac{4(1-p)}{A^2p}$
99. Main objective of work measurement is to
- A. plan and prepare production schedule
 - B. estimate the selling prices and delivery dates
 - C. formulate a proper incentive scheme
 - D. all of the above
100. The following is not the characteristic of work sampling :
- A. Any interruption during study will not affect the results.
 - B. The study causes less fatigue.
 - C. Uneconomical for short cycle jobs.
 - D. A stop watch is needed.
101. The coefficient of friction depends upon
- A. speed of the body.
 - B. geometrical shape of the body.
 - C. size of the body and nature of contacting surfaces.
 - D. nature of contacting surfaces.
102. If a body is in equilibrium then the following is true :
- A. There is no force acting on the body.
 - B. Resultant of all forces is zero but the moments of forces about any point is not zero.
 - C. The moments of the forces about any point is zero, but the resultant of all forces is not zero.
 - D. Both B. and C.
103. Cycle pedalling is an example of
- A. couple
 - B. moment
 - C. two equal and opposite forces
 - D. two unequal parallel forces
104. In case of concurrent coplanar forces, the condition of equilibrium is
- A. $\Sigma H = 0, \Sigma V = 0, \Sigma M = 0$
 - B. $\Sigma H = 0, \Sigma V = 0$
 - C. $\Sigma H = 0, \Sigma M = 0$
 - D. $\Sigma V = 0, \Sigma M = 0$

105. Opening a Limca bottle is due to
A. moment
B. couple
C. torque
D. parallel forces
106. Which of the following statement is correct?
A. The algebraic sum of forces constituting the couple is zero. B. The algebraic sum of the moments of forces constituting the couple about any point is same.
C. A couple cannot be balanced by a single force. D. All of the above.
107. The quantity whose dimensions are $M^2L^2T^{-3}$ could be the product of
A. force and velocity
B. mass and power
C. force and pressure
D. force and distance
108. Effect of a force on a body depends upon
A. magnitude
B. direction
C. line of action
D. all of the above
109. When a helical coiled spring is compressed axially, it possesses
A. potential energy
B. kinetic energy
C. mechanical energy
D. none of the above
110. If the algebraic sum of all the forces acting on a body is zero, then the body may be in equilibrium provided the forces are
A. parallel
B. like parallel
C. unlike parallel
D. concurrent
111. A ladder rests on a smooth ground against a rough wall. The force of friction acts
A. away from the wall at the upper end
B. towards the wall at the lower end
C. upward at the upper end
D. downward at the upper end
112. Polygon of forces is useful for computing the resultant of
A. concurrent spatial forces
B. coplanar parallel forces
C. coplanar concurrent forces
D. coplanar collinear forces
113. The velocity of a body on reaching the ground from a height 'h', is given by
A. $v = 2 gh$
B. $v = 2 gh^2$
C. $v = \sqrt{2gh}$
D. $v = \frac{h^2}{2g}$
114. A rigid body is subjected to non-coplanar concurrent force system. If the body is to remain in a state of equilibrium, then
A. $\Sigma F_x = \Sigma F_y = \Sigma F_z = 0$
B. $\Sigma M_x = \Sigma M_y = 0$
C. $\Sigma M_y = \Sigma M_z = 0$
D. none of the above
115. The resultant of forces $\vec{P} = -2\vec{i} - 3\vec{j}$ and $\vec{Q} = 3\vec{i} - 4\vec{j}$ will lie in (quadrants to be reckoned anticlockwise) quadrant
A. first
B. second
C. third
D. fourth

125. Inertia force of a body is expressed as
- A. product of mass of the body and the acceleration of its centre of gravity in the direction of acceleration.
 - B. product of mass of the body and the acceleration of its centre of gravity acting in an opposite direction to acceleration.
 - C. product of linear acceleration of the body and its mass moment of inertia in the direction of acceleration of its centre of gravity.
 - D. none of the above
126. The total momentum of a system of moving bodies in any one direction remains constant, unless acted upon by an external force in that direction. This statement is called
- A. Principle of conservation of energy
 - B. Newton's second law of motion
 - C. Newton's first law of motion
 - D. Principle of conservation of momentum
127. The dimensions of angular velocity are given by
- A. $M^0L^1T^{-1}$
 - B. $M^0L^2T^{-1}$
 - C. $M^0L^0T^{-2}$
 - D. $M^0L^0T^{-1}$
128. The escape velocity on the surface of the earth is
- A. 1.0 km/s
 - B. 3.6 km/s
 - C. 8.8 km/s
 - D. 11.2 km/s
129. The bodies which rebound after impact are called
- A. elastic
 - B. inelastic
 - C. plastic
 - D. none of the above
130. Two bodies of mass m and M are hung at the ends of a rope passing over a frictional pulley. The acceleration in which the heavier mass M comes down is given by the following :
- A. $\frac{g(M - m)}{M + m}$
 - B. $\frac{g(M + m)}{M - m}$
 - C. $\frac{gM}{M + m}$
 - D. $\frac{g \times M}{M - m}$
131. The wheels of a moving car possesses
- A. kinetic energy of translation only
 - B. kinetic energy of rotation only
 - C. kinetic energy of translation and rotation both
 - D. strain energy
132. The total energy possessed by moving bodies
- A. remain constant at every instant
 - B. varies from time to time
 - C. is maximum at the start
 - D. is minimum before stopping
133. For the maximum range of a projectile, the angle of projection should be
- A. 30°
 - B. 45°
 - C. 60°
 - D. 90°

- 145. The minimum number of teeth of standard proportion with involute profile and 20° pressure angle spur gear is
 - A. 12
 - B. 18
 - C. 32
 - D. 48
- 146. Normal efficiency in a single reduction worm gear pair with the velocity ratio 70 would be
 - A. above 98 %
 - B. 50 to 80 %
 - C. less than 30 %
 - D. less than 10 %
- 147. The pressure angle of a flat footed follower in contact with a circular arc cam is
 - A. 5°
 - B. 3°
 - C. 0°
 - D. -1°
- 148. The minimum number of teeth in an involute gear with one module addendum with pressure angle of 14 1/2° to avoid undercutting is
 - A. 32
 - B. 20
 - C. 12
 - D. 40
- 149. In an epicyclic gear train, the number of planets in any given row will be
 - A. equal to 1
 - B. equal to or more than 1
 - C. more than 1
 - D. more than 2
- 150. For a roller follower, pitch curve and cam surface are
 - A. identical
 - B. separated by the radius of the roller
 - C. separated by the diameter of the roller
 - D. separated by one and half times the radius of the roller
- 151. The radius of gyration of a disc type of flywheel of diameter D is
 - A. D
 - B. D/2
 - C. D/√2
 - D. D/√3
- 152. The power transmitted by a belt is maximum when the maximum tension in the belt compared to centrifugal tension is
 - A. 2.0 times
 - B. 2.5 times
 - C. 3.0 times
 - D. 4.0 times
- 153. In a slotted lever quick return mechanism, the crank length is 20 cm while the distance between centres of crank and slotted lever rotation is 40 cm. What is the ratio of cutting stroke time to return stroke time ?
 - A. 2
 - B. 3
 - C. 4
 - D. 5
- 154. In a four bar mechanism the following instantaneous centre of rotation is not present:
 - A. Fixed
 - B. Permanent
 - C. Neither fixed nor permanent
 - D. Perpendicular to the line joining centre of rotations of crank and lever at infinity

155. In a slider crank mechanism, piston velocity becomes maximum for the following configuration when crank is
- A. at inner dead centre
 - B. at outer dead centre.
 - C. perpendicular to line of stroke
 - D. perpendicular to connecting rod
156. The sensitivity of an isochronous governor is
- A. infinity
 - B. zero
 - C. one
 - D. two
157. The maximum angular acceleration of the connecting rod with crank to connecting rod ratio 1.5 and crank running at 3000 rpm is around
- A. $1.8 \times 10^4 \text{ rad/s}^2$
 - B. $9 \times 10^4 \text{ rad/s}^2$
 - C. $0.9 \times 10^4 \text{ rad/s}^2$
 - D. $3 \times 10^4 \text{ rad/s}^2$
158. The number of instantaneous centres for a six link mechanism in planer motion is
- A. 30
 - B. 15
 - C. < 6
 - D. > 6
159. In a slotted lever quick return mechanism the number of instantaneous centres of rotation is
- A. 6
 - B. 10
 - C. 12
 - D. 15
160. A simple mechanism has the following number of links :
- A. 4
 - B. 3
 - C. 2
 - D. 1
161. The working surface above the pitch surface of a gear tooth is termed as
- A. addendum
 - B. dedendum
 - C. flank
 - D. face
162. In petrol engine, governor manipulates
- A. fuel pump
 - B. atomiser
 - C. filter
 - D. throttle valve
163. In locomotives, the ratio of length of connecting rod to crank radius is kept very large in order to
- A. facilitate quick starting
 - B. minimise primary forces
 - C. minimise the effect of secondary forces
 - D. achieve perfect balancing
164. The principal object of a brake is to
- A. balance the energy
 - B. give energy
 - C. absorb energy
 - D. none of the above
165. A spheric pair such as ball and socket joint has n degrees of freedom, where n is equal to
- A. 0
 - B. 1
 - C. 2
 - D. 3
166. Efficiency in a normal spur gear pair will be
- A. above 98 %
 - B. 70 to 80 %
 - C. less than 50 %
 - D. less than 30 %

