

Objective Paper-II-2011

1. Total number of instantaneous centers of rotation for a mechanism having n links is
(A) $\frac{n(n-1)}{2}$ (B) $\frac{n}{2}$ (C) $n-1$ (D) n

2. Consider the following statements pertaining to an example for a cylindrical pair:
(1) Piston and cylinder of an IC engine
(2) Shaft supported by a foot step bearing
(3) Doctor's injection syringe
(4) A screw driver operating on a screw
Which of these statements are correct?
(A) 1 and 4 (B) 2 and 3 (C) 1 and 3 (D) 3 and 4

3. The number of degrees of freedom of an epicyclic gear train is
(A) Zero (B) One (C) Two (D) Three

4. The advantages of involute profile over cycloidal are given below. Which of these is NOT correct?
(A) The interference is inherently absent in the involute system
(B) In the involute system, the pressure angle is constant from commencement to end of engagement
(C) The straight teeth of the basic rack for the involute profile admits of simple tools
(D) The profile for the flank and face is a single curve in the involute system

5. Flywheel absorbs energy during those periods of crank rotation when
(A) The twisting moment is greater than the resisting moment
(B) The twisting moment is equal to the resisting moment
(C) The twisting moment is less than the resisting moment
(D) The load on the engine falls

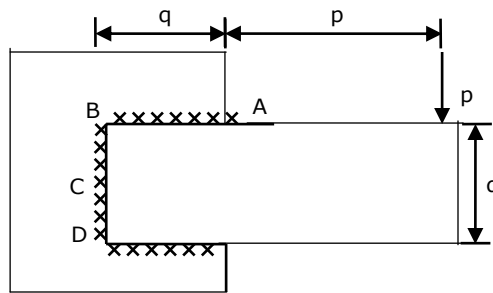
6. Introduction of the flywheel in a rotating system smoothens
(A) The bending moment on the rotating shaft
(B) The twisting moment on the shaft
(C) The bending stress on the shaft
(D) The axial force along the shaft

7. A four stroke six cylinder in line engine symmetrical about centre line can be balanced for
(A) Primary inertia forces and couples only
(B) Primary and secondary inertia forces only
(C) Secondary inertia forces and couples only
(D) All forces and couples

8. Given below are four Vee twin engines with different included angles between cylinder axes. Which one of these engines can be completely balanced for primary forces by attaching a single revolving mass opposite to the crank pin?
- (A) Vee 45° twin engine (B) Vee 90° twin engine
(C) Vee 60° twin engine (D) Vee 120° twin engine
9. Large field guns, which come to initial position after firing in shortest possible time, are
- (A) Under damped (B) Critically damped
(C) Over damped (D) Un-damped
10. Which of the following type of viscous damping will give periodic motion to the vibrating body?
- (1) Under damping
(2) Critical damping
(3) Over damping
- (A) 1 only (B) 2 only (C) 3 only (D) 1 and 2
11. Consider the following statements. Transmissibility of vibrations:
- (1) Is more than 1, when $\frac{\omega}{\omega_n} < \sqrt{2}$
(2) Is less than 1, when $\frac{\omega}{\omega_n} > \sqrt{2}$
(3) Increases as the damping is increased
- Which of these statements are correct?
- (A) 1,2 and 3 (B) 1 and 2 only
(C) 2 and 3 only (D) 1 and 3 only
12. Rayleigh's method of computing the fundamental natural frequency is based on
- (A) Conservation of energy (B) Conservation of momentum
(C) Conservation of masses (D) Laws of statics
13. In hydrodynamic journal bearings, if the clearance ratio is halved then the Sommerfeld number S and the coefficient of friction μ will change as
- (A) S becomes double and μ is halved
(B) S becomes four times and μ is doubled
(C) S becomes four times and μ is halved
(D) S becomes double and μ is also doubled

14. A rope has been designated as 6 x 19. The number 6 and 19 respectively stand for
(A) Rope diameter and the number of wires
(B) Rope diameter and the number of strands
(C) Number of strands and the number of wires
(D) Number of wires and the number of strands
15. If there are n_1 disc on the driving shaft and n_2 discs on the driven shaft in a multi-plate clutch, then the number of pairs of contact surfaces is
(A) $n_1 + n_2$ (B) $n_1 + n_2 - 1$ (C) $n_1 + n_2 - 2$ (D) $n_1 + n_2 + 1$
16. Consider the following statements pertaining to V belts in power transmission:
(1) Standard V belts are available in 7 sizes of cross section A to G
(2) Standard V belts are available in 5 sizes of cross section A to E
(3) Standard V belts are available in 5 sizes of cross section A to E with A having largest cross section
(4) The included angle for the belt groove is usually around 35°
Which of these statements are correct?
(A) 1 only (B) 2 and 4 (C) 3 and 4 (D) 1 and 4
17. An axle is a machine part that is subjected to
(A) Transverse loads and bending moment (B) Twisting moment only
(C) Twisting moment and axial load (D) Bending moment and axial load
18. In a bolt of uniform strength
(A) Nominal diameter of thread is equal to the diameter of shank of the bolt
(B) Nominal diameter of thread is larger than the diameter of shank of the bolt
(C) Nominal diameter of thread is less than the diameter of shank of the bolt
(D) Core diameter of threads is equal to the diameter of shank of the bolt
19. Interference fit joints are provided for
(A) Assembling bush bearing in housing (B) Mounting heavy duty gears on shafts
(C) Mounting pulley on shafts (D) Assembly of flywheels on shaft
20. When a journal rotates in anticlockwise direction at high speed in a bearing having adequate supply of lubricant, it will be
(A) Pushed to the left of the bearing centre and is likely to have no metal contact with the bearing
(B) Resting just below the bearing centre without making metal to metal contact
(C) Pushed to the right of the bearing centre and make no metal to metal contact
(D) Running concentric with the bearing centre and make no metal to metal contact

21. In wire ropes which one of the following statements is correct?
- (A) Bending stress is directly proportional to the wire diameter and inversely proportional to the sheave diameter
- (B) Both fatigue and wear are due to the tensile stress on the wires bearing against the sheave
- (C) Bending stress is inversely proportional to the wire diameter and directly proportional to sheave diameter
- (D) Both fatigue and wear are due to shear stress on the wires bearing against the sheave
22. A compound fillet welded joint loaded by P, is shown below. The maximum shearing stress occurs at point _____



- (A) A and D (B) B and D (C) A only (D) C only
23. A fillet weld loaded parallel to its length l by a load P . If the weld leg is h , the average shear stress on the throat area is
- (A) $\frac{P}{hl}$ (B) $\frac{P}{0.5hl}$ (C) $\frac{2P}{hl}$ (D) $\frac{1.414P}{hl}$
24. Bevel gears having equal number of teeth and equal pitch angles connect two orthogonally intersecting shafts. This system of gears is known as
- (A) Crown gears (B) Hypoid gears (C) Worm gears (D) Mitre gears
25. A solid steel shaft of diameter d and length l is subjected to twisting moment I . Another shaft B of brass having same diameter d , but length $l/2$ is also subjected to the same moment. If shear modulus of steel is two times that of brass, the ratio of the angular twist of steel to that of brass shaft is
- (A) 1 : 2 (B) 1 : 1 (C) 2 : 1 (D) 4 : 1
26. A high pressure angle for spur gears leads to
- (A) Minimum axial thrust (B) Greater backlash
- (C) More interference (D) Wide base and stronger tooth

27. Match List – I with List – II and select the correct answer using the code given below the lists.

List – I	List - II
(P) Unwin’s formula	(1) Bearing
(Q) Wahl factor	(2) Rivets
(R) Reynold’s equation	(3) Gears
(S) Lewis form factor	(4) Springs

(A) P-3, Q-1, R-4, S-2

(B) P-2, Q-1, R-4, S-3

(C) P-3, Q-4, R-1, S-2

(D) P-2, Q-4, R-1, S-3

28. Antifriction bearings are normally used in shafts

(1) Running at 20,000 to 40,000 rpm

(2) Running at speeds up to 6,000 rpm

(3) Of diameters up to 500 mm

(4) Of diameter more than 500 mm

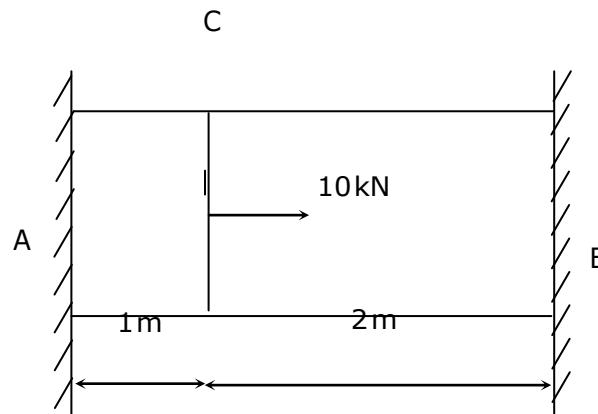
(A) 1 and 3

(B) 2 and 3

(C) 2 and 4

(D) 1 and 4

29. A prismatic bar, as shown in figure is supported between rigid supports. The support reactions will be



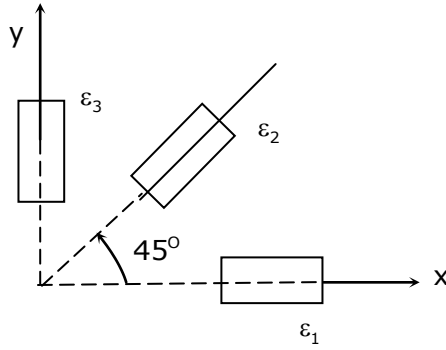
(A) $R_A = \frac{10}{3}$ kN and $R_B = \frac{20}{3}$ kN

(B) $R_A = \frac{20}{3}$ kN and $R_B = \frac{10}{3}$ kN

(C) $R_A = 10$ kN and $R_B = 10$ kN

(D) $R_A = 5$ kN and $R_B = 5$ kN

30. A rectangular strain rosette, shown in figure, gives following readings in a strain measurement task, $\epsilon_1 = 1000 \times 10^{-6}$, $\epsilon_2 = 800 \times 10^{-6}$, $\epsilon_3 = 600 \times 10^{-6}$. The direction of the major principal strain with respect to gauge 1 is



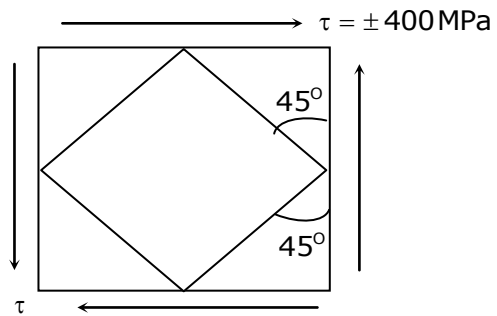
- (A) 0° (B) 15° (C) 30° (D) 45°

31. If a piece of material neither expands nor contracts in volume when subjected to stresses, then the Poisson's ratio must be

- (A) Zero (B) 0.25 (C) 0.33 (D) 0.5

32. What are the normal and shear stresses on the 45° planes shown?

- (A) $\sigma_1 = -\sigma_2 = 400 \text{ MPa}$ and $\tau = 0$
 (B) $\sigma_1 = \sigma_2 = 400 \text{ MPa}$ and $\tau = 0$
 (C) $\sigma_1 = \sigma_2 = -400 \text{ MPa}$ and $\tau = 0$
 (D) $\sigma_1 = \sigma_2 = \tau = \pm 200 \text{ MPa}$



33. Materials which show direction dependent properties are called

- (A) Homogeneous (B) Viscoelastic (C) Isotropic (D) Anisotropic

34. If a rod expands freely due to heating, it will develop

- (A) Bending stress (B) Thermal stress
 (C) No stress (D) Compressive stress

35. Match List – I with List – II and select the correct answer using the code given below the lists.

List – I	List – II
(P) Subjected to bending moment at the end of a cantilever	(1) Triangle
(Q) Cantilever carrying uniformly distributed load over the whole length	(2) Cubic Parabola
(R) Cantilever carrying linearly varying load from zero at the free end to maximum at the supports	(3) Parabola
(S) A beam having load at centre and supported at the ends	(4) Rectangle

- (A) P-1, Q-2, R-3, S-4
(B) P-4, Q-3, R-2, S-1
(C) P-1, Q-3, R-2, S-4
(D) P-4, Q-2, R-3, S-1
36. A T-section beam is simply supported and subjected to a uniform distributed load over its whole span. Maximum longitudinal stress in the beam occurs at
(A) Top fibre of the flange
(B) The junction of web and flange
(C) The mid-section of the web
(D) The bottom fibre of the web
37. For the two shafts connected in parallel
(A) Torque in each shaft is the same
(B) Shear stress in shaft is the same
(C) Angle of twist of each shaft is the same
(D) Torsional stiffness of each shaft is the same
38. Two equal lengths of steel wires of the same diameter are made into two springs S_1 and S_2 of mean diameters 75 mm and 60 mm respectively. The stiffness ratio of S_1 and S_2 is
(A) $\left(\frac{60}{75}\right)^2$
(B) $\left(\frac{60}{75}\right)^3$
(C) $\left(\frac{75}{60}\right)^2$
(D) $\left(\frac{75}{60}\right)^3$
39. Solid material chemical bonds are
(A) Ionic, molecular and fusion
(B) Covalent, fusion and fission
(C) Ionic, covalent and molecular
(D) Fission, molecular and ionic
40. Cleavage fracture is a form of
(A) Brittle fracture
(B) Ductile fracture
(C) Elastic fracture
(D) Viscoelastic fracture
41. Match List – I with List – II and select the correct answer using the code given below the lists.
- | List – I | List – II |
|----------------|---------------|
| (P) Alpha iron | (1) FCC |
| (Q) Zinc | (2) BCC |
| (R) Glass | (3) HCP |
| (S) Copper | (4) Amorphous |
- (A) P-1, Q-4, R-3, S-2
(B) P-2, Q-4, R-3, S-1
(C) P-1, Q-3, R-4, S-2
(D) P-2, Q-3, R-4, S-1
42. In a triclinic unit cell
(A) $\alpha = \beta = \gamma = 90^\circ$
(B) $\alpha = \beta = 90^\circ, \gamma = 120^\circ$
(C) $\alpha = \beta = 90^\circ \neq \gamma$
(D) $\alpha \neq \beta \neq \gamma \neq 90^\circ$

43. Structure of common glass is
 (A) Amorphous (B) Partially crystalline
 (C) Fully crystalline (D) None of these
44. Liquid + solid (1) on cooling converting into solid (2) reaction is known as:
 (A) Eutectoid reaction (B) Eutectic reaction
 (C) Peritectic reaction (D) Peritectoid reaction
45. Match List – I with List – II and select the correct answer using the code given below the lists.

List – I	List – II
(P) System	(1) Free energy is a minimum
(Q) Phase	(2) Chemical elements or chemical compounds
(R) Phase equilibrium	(3) Consists of solids, liquids or gases or their combination
(S) Components	(4) Homogeneous portion of a system that has uniform physical characteristics

- (A) P-2, Q-1, R-4, S-3 (B) P-3, Q-1, R-4, S-2
 (C) P-2, Q-4, R-1, S-3 (D) P-3, Q-4, R-1, S-2

46. Babbitt is an alloy of
 (A) Sn, Cu, Sb and Pb (B) Sn and Cu
 (C) Sn, Cu and Pb (D) Sn, Cu and Sb
47. Resilience of a material becomes important when it is subjected to
 (A) Fatigue (B) Thermal stresses
 (C) Shock loading (D) Pure static loading
48. During tensile testing it has been observed that for some material the deformation is fully recoverable and time – independent, but does not obey Hook’s law. The material is
 (A) Elastomer (B) Rubber
 (C) Polymer (D) Aluminium alloy

49. Match List – I with List – II and select the correct answer using the code given below the lists.

List – I	List – II
(P) Copper	(1) Corrosion
(Q) Nickel	(2) Demagnetization
(R) Manganese	(3) Non sparking
(S) Vanadium	(4) Deformation restriction at high temperature

(R) Ultrasonic welding	(3) Clean heat source created much away from job, a narrow spot is heated, work chamber operates in a high vacuum
(S) Friction welding	(4) Clean heat source, very quick heating, very small focal spot, no vacuum chamber is required

(A) P-4, Q-3, R-1, S-2

(B) P-2, Q-3, R-1, S-4

(C) P-4, Q-1, R-3, S-2

(D) P-2, Q-1, R-3, S-4

76. Cold-cracking in steel weldments depends on

(1) Carbon equivalent

(2) Heat input

(3) Effective thickness

(4) Hydrogen content in weld pool

(A) 1, 2 and 3 only

(B) 1, 2 and 4 only

(C) 2, 3 and 4 only

(D) 1, 2, 3 and 4

77. In Norton type feed gearbox for cutting Whitworth standard threads with a standard TPI Lead screw, power flows from

(A) Spindle to Tumbler gear to Norton cone to Meander drive to Lead screw

(B) Spindle to Norton cone to Tumbler gear to Meander drive to Lead screw

(C) Spindle to Tumbler gear to Meander drive to Norton cone to Lead screw

(D) Spindle to Norton cone to Meander drive to Tumbler gear to Lead screw

78. Match List – I with List – II and select the correct answer using the code given below the lists.

List – I	List – II
(P) Lathe	(1) Flute
(Q) Shaper	(2) Universal indexing
(R) Drilling machine	(3) Lead screw
(S) Milling machine	(4) Rocker arm

(A) P-2, Q-4, R-1, S-3

(B) P-3, Q-4, R-1, S-2

(C) P-2, Q-1, R-4, S-3

(D) P-3, Q-1, R-4, S-2

79. Trajectory of a robot means

(A) Path traced by the end effectors

(B) Kinematics of Robot

(C) Robot joints

(D) Robot programming

80. Typical coolants used for machining aluminium are

(1) Kerosene oil

(2) Soda water

(3) Air

(4) Paraffin oil

87. The component reliability is usually measured by: reliability (CR), failure rates (FR) and mean time between failures (MTBF). The MTBF is
- (A) A number of failures/unit–hours of operation
 - (B) Unit-hours of operation / number of failures
 - (C) Number of failures / number of tested
 - (D) Number of failures × unit–hours of operation

88. A basic feasible solution of an $m \times n$ transportation problem is said to be non degenerate if the allocations are in independent positions and starting basic feasible solution contains exactly following number of individual allocations
- (A) $m + n$
 - (B) $m \times n$
 - (C) $m + n - 1$
 - (D) $m + n + 1$

89. Consider the following terms used to study the functions of the material:

- (1) Use value
- (2) Esteem value
- (3) Exchange value
- (4) Scrap value

Which of these are used to identify in the value engineering approach?

- (A) 1, 2, 3 and 4
- (B) 1, 3 and 4 only
- (C) 1, 2 and 3 only
- (D) 2, 3 and 4 only

90. Which of the following method is NOT used for obtaining the initial basic feasible solution in transportation problems?
- (A) North west corner method
 - (B) Least cost entry method
 - (C) Vogel’s approximation method
 - (D) MODI method

91. Match List – I with List – II and select the correct answer using the code given below this lists.

List – I	List – II
(P) R	(1) Ranges
(Q) p	(2) Number of defects/unit
(R) C	(3) Number of defects
(S) U	(4) Fraction defectives

- (A) P–1, Q–4, R–3, S–2
- (B) P–2, Q–4, R–3, S–1
- (C) P–1, Q–3, R–4, S–2
- (D) P–2, Q–3, R–4, S–1

92. An unbound solution of a linear programming problem is reflected in the simplex method, when
- (A) All the ratio of ‘right hand sides’ to coefficients in key column become negative
 - (B) All the ratios of right hand sides to coefficients in key columns become zero
 - (C) All right hand sides become negative
 - (D) All right hand sides become zero

93. When the ordering cost is increased to 4 times, the EOQ will be increased to
(A) 2 times (B) 3 times (C) 8 times (D) Remain same
94. For a single server queue, the mean arrival rate is equal to 8/hr and the mean service rate is 12/hr. The expected number in waiting line is equal to
(A) 0.5 (B) 1.33 (C) 2 (D) 3
95. In the queuing theory, if the arrivals in a single server model follow Poisson distribution, the time between arrivals will follow a
(A) Gamma distribution (B) Exponential distribution
(C) Binomial distribution (D) Weibull distribution
96. Which of the following are the advantages of MOS devices over bipolar devices?
(1) Easy to fabricate
(2) Allows higher bit densities
(3) Cost effective
(s) Operational speed
(A) 1, 2, 3 and 4 (B) 1, 2 and 3 only
(C) 2, 3 and 4 only (D) 1, 3 and 4 only
97. The number of RAM chips of size $(256k \times 1)$ required to build a 2M byte memory is
(A) 16 (B) 32 (C) 64 (D) 128
98. Refreshing circuit is required in
(A) ROM (B) Static RAM (C) Dynamic RAM (D) All of these
99. Which of the following statement(s) is/are correct?
(1) Bus is a group of wires carrying information
(2) Bus can carry data
(3) Bus cannot carry address
(4) A bus can be shared by more than one device
(A) 1, 2, 3 and 4 (B) 1, 2 and 3 only
(C) 1, 2 and 4 only (D) 2, 3 and 4 only
100. In flowcharting, the connector symbol is a
(A) Parallelogram (B) Square (C) Diamond (D) Circle
101. Which of the following are the advantages of flowchart?
(1) A flowchart is independent of language
(2) It is easy to develop a program with flowchart
(3) If there are any changes in the program, it is very easy to make changes

- (A) 1 and 2 only (B) 1 and 3 only
(C) 2 and 3 only (D) 1, 2 and 3

102. In flowcharting, a parallelogram would be used to represent
(A) Getting a keyboard entry from the user
(B) The beginning of the flowchart
(C) A decision point that determines which of two branches to follow
(D) A mathematical calculation

103. USM has good machining performance for
(A) Al (B) Steel
(C) Super alloys (D) Refractory material

104. Consider the following statements.
(1) Create a database alias
(2) Create the tables needed
(3) Create indexes
(4) Create a directory for the tables
What is the correct sequence of order for creating a new database in dBase?
(A) 4-2-1 and 3 (B) 3-1-2 and 4
(C) 4-1-2 and 3 (D) 3-2-1 and 4

105. Match List – I with List – II and select the correct answer using the code given below the lists.

List - I	List – II
(P) Worksheet	(1) dBase III
(Q) Records	(2) C language
(R) Pointers	(3) FORTRAN
(S) Compiler	(4) Lotus 1-2-3

- (A) P–4,Q–2,R–1,S–3 (B) P–3,Q–2,R–1,S–4
(C) P–4,Q–1,R–2,S–3 (D) P–3,Q–1,R–2,S–4

106. High energy rate forming process used for forming components from thin metal sheets or deform thin tubes is.
(A) Petro-forming (B) Magnetic pulse forming
(C) Explosive forming (D) Electro-hydraulic forming

107. In the 3-2-1 principle of fixture design, 3 refers to number of
(A) Setups possible (B) Clamps required
(C) Positions on primary face (D) Locating positions

108. The optimum cutting speed is one which should have
 (1) High metal removal rate
 (2) High cutting tool life
 (3) Balance the metal removal rate and cutting tool life
 (A) 1, 2 and 3 (B) 1 and 2 only (C) 2 and 3 only (D) 3 only
109. Satellite is a non-ferrous cast alloy composed of
 (A) Cobalt, chromium and tungsten
 (B) Tungsten, vanadium and chromium
 (C) Molybdenum, tungsten and chromium
 (D) Tungsten, molybdenum, chromium and vanadium
110. External threads can be produced by
 (1) Rolling
 (2) Grinding
 (3) Milling
 (A) 1 and 3 only (B) 1 and 2 only (C) 2 and 3 only (D) 1, 2 and 3
111. Match List – I with List – II and select the correct answer using the code given below the lists.

List – I	List – II
(P) Top gate	(1) Heavy and large castings
(Q) Bottom gate	(2) Most widely used and economical
(R) Parting gate	(3) Turbulence
(S) Step gate	(4) Unfavorable temperature gradient

- (A) P–3, Q–4, R–2, S–1 (B) P–1, Q–4, R–2, S–3
 (C) P–3, Q–2, R–4, S–1 (D) P–1, Q–2, R–4, S–3

Directions: -

Each of the next Nine (9) items consists of two statements, one labeled as the ‘Assertion (A)’ and the other as ‘Reason (R)’. You are to examine these two statements carefully and select the answers to these items using the codes given below:

Codes:

- (A) Both A and R are individually true and R is the correct explanation of A
 (B) Both A and R are individually true but R is NOT the correct explanation of A
 (C) A is true but R is false
 (D) A is false but R is true

112. **Assertion (A)** : The centrifugal tension in a belt is $T_c = mv^2$.
Reason (R) : Since this expression is independent of the cross-section, it follows that T_c is independent of the belt size.

113. **Assertion (A)** : Hot tears occur during forging because of inclusions in the blank material
Reason (R) : Bonding between the inclusions and the parent material is through physical and chemical bonding.
114. **Assertion (A)** : Lead, Zinc and tin are always hot worked.
Reason (R) : If they are worked in cold state they cannot retain their mechanical properties.
115. **Assertion (A)** : Excess defects are created by hammering the crystalline materials.
Reason (R) : the thermal fluctuations create the point defects in crystalline materials.
116. **Assertion (A)** : Solid solutions of metal are crystals whose properties are close to those of the solvent.
Reason (R) : They retain the same crystal lattice and type of bond.
117. **Assertion (A)** : Carburizing is used for machine elements which have to have a wear resistant working surface.
Reason (R) : The compositions of surface layers are changed in carburizing.
118. **Assertion (A)** : The steel when heated above a certain temperature and cooled to room temperature, structure adjustment stabilizes.
Reason (R) : The modification is mainly based on cooling rate.
119. **Assertion (A)** : The plastic organic materials can be easily shaped or moulded by mechanical action.
Reason (R) : It is widely in use as it can be permanently moulded.
120. **Assertion (A)** : A composite is a multiphase material which is artificially made as one that occurs naturally.
Reason (R) : Technology of modern age requires a material with unusual combination of properties that cannot be met by metal or alloys.