

Objective Paper-II-2012

1. The driving and driven shafts connected by a Hooke's joint are inclined by an angle α to each other. The angle through which the driving shaft turns is given by θ . The condition for the two shafts to have equal speeds is
(A) $\cos \theta = \sin \alpha$ (B) $\sin \theta = \pm \sqrt{\tan \alpha}$ (C) $\tan \theta = \pm \sqrt{\cos \alpha}$ (D) $\cot \theta = \cos \alpha$

2. In a crank and slotted lever quick return motion mechanism, the distance between the fixed centers is 160 mm and the driving crank is 80mm long. The ratio of time taken by cutting and return strokes is
(A) 0.5 (B) 1 (C) 1.5 (D) 2

3. In an elliptic trammel, the length of the link connecting the two sliders is 100mm. The tracing pen is placed on 150mm extension of this link. The major and minor axes of the ellipse traced by the mechanism would be
(A) 250 mm and 150 mm (B) 250 mm and 100 mm
(C) 500mm and 300 mm (D) 500 mm and 200 mm

4. The differential gear is fitted on rear axle of automobiles; its function is
(A) To rotate the front wheels at different speeds
(B) To rotate the back wheels at the same speed during turning
(C) To rotate the back wheel at different speeds during turning
(D) To permit the two back wheels to rotate at the different speeds when driving in the straight path

5. Consider the following profiles of mating gear teeth
 1. Involute profiles
 2. Cycloidal profiles
 3. Conjugate profilesWhich of these satisfy the law of gearing?
(A) 1 and 2 only (B) 1 and 3 only
(C) 2 and 3 only (D) 1, 2 and 3

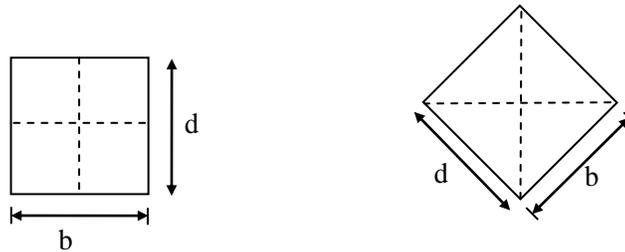
6. In the case of involute system of gears, if the centre distance is changed
(A) The velocity ratio changes
(B) The pressure angle changes
(C) The pitch circle remain unaffected
(D) The law of gearing fails to get satisfied

12. A three cylinder radial engine driven by a common crank of radius r has the cylinders spaced at 120° among each other. The mass of the reciprocating parts per cylinder is m kg. The primary unbalance force at a crank shaft speed of ω rad/s
- (A) $\frac{3}{2}m\omega^2r$ (B) $3m\omega^2r$ (C) $\frac{1}{3}m\omega^2r$ (D) $m\omega^2r$
13. A free damped vibration system with viscous damping consists of a mass m , spring stiffness k and a damper with a damping coefficient which can be varied. The natural frequency of the system is ω_n . For the system to be critically damped, the damping coefficient C_c is
- (A) $2m\omega_n$ (B) $m\omega_n$ (C) $\sqrt{2}m\omega_n$ (D) $\frac{1}{\sqrt{2}}m\omega_n$
14. In case of free vibrations with viscous damping, the damping force is proportional to
- (A) The displacement (B) The velocity
(C) The acceleration (D) The natural frequency
15. The critical speed of shaft depends on
- (A) Mass only (B) Stiffness only
(C) Mass and Stiffness (D) Mass, Stiffness and Eccentricity
16. A cotter joint is capable of transmitting
- (A) The twisting moment
(B) An axial tensile as well as compressive load
(C) The bending moment
(D) Only axial compressive
17. Consider the following statements associated with variable loading of bolts:
1. Smaller the stiffness constant, larger will be the external load carried by the bolts
 2. Greater the pre-tension, lesser will be the value of the alternating load carried by the bolts
 3. In variable loading, variable component is more dangerous than static component
 4. A high value of pre-tension is undesirable against fatigue failure
- Which of these statements are correct?
- (A) 1, 2, 3 and 4 (B) 2 and 3 only
(C) 2 and 4 only (D) 1 and 2 only
18. A fit on a hole– shaft system is specified as H7–s6. The type of fit is
- (A) Clearance fit (B) Running (sliding) fit
(C) Transition fit (D) Interference fit
19. A flat end foot step bearing supports a vertical shaft of 150 mm diameter rotating at 10 rad/s. The shaft carries a vertical load of 20 kN. Assuming uniform pressure distribution and coefficient of friction equal to 0.05, the power lost in friction is
- (A) 500W (B) 750W (C) 1000W (D) 1125W

20. The effect of increasing the stiffness springs of centrifugal clutch is
(A) The decrease of engagement speed
(B) The increase of engagement speed
(C) The increase of frictional force at maximum speed
(D) None of these
21. In a flat belt drive the maximum tension which the belt can be subjected to is T and the mass of the belt per unit length is m kg. The velocity of the belt for maximum power transmission is
(A) $\sqrt{\frac{T}{3m}}$ (B) $\sqrt{\frac{T}{m}}$ (C) $\frac{T}{3m}$ (D) $\frac{T}{m}$
22. Creep of belt can be controlled by
(A) Decreasing belt length (B) Reducing stress in belt
(C) Increasing centre distance (D) Reducing belt velocity
23. The differential screw is used in a
(A) Turnbuckle (B) Micrometer
(C) Vernier caliper (D) Coupler
24. Multi start threads are used to get
(A) Smaller linear displacement
(B) Larger linear displacement with assured self locking
(C) Larger linear displacement with no guarantee of self locking
(D) None of these
25. Consider the following statements
In an epicyclic gear train with 96 and 36 number of teeth on the annulus and sun respectively
1. Planet must have 30 teeth
 2. There must be 3 or 4 planets around the circumference
 3. Planets can never be input or output links.
 4. Planets of the sun should be more than the rest
- Which of these statements are correct?
(A) 1, 2, 3 and 4 (B) 1, 3 and 4 only
(C) 1, 2 and 3 only (D) 2, 3 and 4 only
26. Stub tooth is
(A) Provided on the rack only (B) A tooth of standard profile
(C) Larger than standard tooth (D) Shorter than standard tooth

27. The boring bar of a boring machine is 25 mm in diameter. During operation, the bar gets twisted through 0.01 radians and is subjected to a shear stress of 42 N/mm^2 . The length of the bar is (Taking $G = 0.84 \times 10^5 \text{ N/mm}^2$)
- (A) 500 mm (B) 250 mm (C) 625 mm (D) 375 mm
28. Which of the following screw threads is adopted for power transmission in either direction?
- (A) Acme threads (B) Square threads
(C) Buttress threads (D) Multiple threads
29. In hydrodynamic bearings
- (A) The oil film is maintained by supplying oil under pressure
(B) The oil film pressure is generated only by the rotation of journal
(C) External supply of lubricant is not required
(D) Grease is used for lubrication
30. The piston pin bearings in heavy duty diesel engines are
- (A) Needle roller bearings (B) Tapped roller bearings
(C) Spherical roller bearings (D) Cylindrical roller bearings
31. The magnitude of stress induced in a shaft due to applied torque varies
- (A) From maximum at the centre to zero at the circumference
(B) From zero at the centre to maximum at the circumference
(C) From maximum at the centre to minimum but not zero at the circumference
(D) From minimum but not zero at the centre, to maximum at the circumference
32. An elastic material of Young's modulus E and Poisson's ratio ν is subjected to a compressive stress of σ_1 in the longitudinal direction. Suitable lateral compressive stress σ_2 are also applied along the other two lateral directions to limit the net strain in each of lateral directions to half of the magnitude that would be under σ_1 acting alone. The magnitude of σ_2 is
- (A) $\frac{\nu}{2(1+\nu)}\sigma_1$ (B) $\frac{\nu}{2(1-\nu)}\sigma_1$ (C) $\frac{\nu}{(1+\nu)}\sigma_1$ (D) $\frac{\nu}{(1-\nu)}\sigma_1$
33. A piece of material is subjected, to two perpendicular tensile stresses of 70 MPa and 10MPa. The magnitude of the resultant stress on a plane in which the maximum shear stress occurs is
- (A) 70 MPa (B) 60 MPa (C) 50 MPa (D) 10 MPa
34. Which of the following hardness tests uses the principle of measurement of depth of indentation for obtaining the hardness value of the material being tested?
- (A) Brinell (B) Rockwell (C) Vickers (D) Barcol

35. A copper rod 400mm long is pulled in tension to a length of 401.2 mm by applying a tensile load of 330 MPa. If the deformation is entirely elastic, the Young's modulus of copper is
 (A) 110 GPa (B) 110 MPa (C) 11 GPa (D) 11 MPa
36. A rod of length l tapers uniformly from a diameter D at one end to a diameter d at the other. The Young's modulus of the material is E . The extension caused by an axial load P is
 (A) $\frac{4Pl}{\pi(D^2 - d^2)E}$ (B) $\frac{4Pl}{\pi(D^2 + d^2)E}$ (C) $\frac{4Pl}{\pi DdE}$ (D) $\frac{2Pl}{\pi DdE}$
37. A bar of copper and steel form a composite system which is heated through a temperature of 40°C . The stress induced in the copper bar is
 (A) Tensile (B) Compressive
 (C) Both tensile and compressive (D) Shear
38. The buckling load for a column hinged at both ends is 10kN. If the ends are fixed, the buckling load changes to
 (A) 40 kN (B) 2.5 kN (C) 5 kN (D) 20 kN
39. The ratio of the moments of resistance of a square beam (Z) when square section is placed (i) with two sides horizontal (Z_1) and (ii) with a diagonal horizontal (Z_2) as shown is



- (A) $\frac{Z_1}{Z_2} = 1.0$ (B) $\frac{Z_1}{Z_2} = 2.0$ (C) $\frac{Z_1}{Z_2} = \sqrt{2}$ (D) $\frac{Z_1}{Z_2} = 1.5$
40. A beam with a rectangular section of $120\text{mm} \times 60\text{mm}$, designed to be placed vertically is placed horizontally by mistake. If the maximum stress is to be limited, the reduction in load carrying capacity would be
 (A) $\frac{1}{4}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) $\frac{1}{6}$
41. If a solid circular shaft of steel 2 cm in diameter is subjected to permissible shear stress 10KN/cm^2 . then the value of the twisting moment (T_r) will be.
 (A) $10 \pi \text{ KN-cm}$ (B) $20 \pi \text{ KN-cm}$ (C) $15 \pi \text{ KN-cm}$ (D) $5 \pi \text{ KN-cm}$

42. A solid shaft of diameter 100 mm, length 1000 mm is subjected to a twisting moment T . The maximum shear stress developed in the shaft is 60 N/m^2 . A hole of 50 mm diameter is now drilled throughout the length of the shaft. To develop a maximum shear stress of 60 N/m^2 in the hollow shaft, the torque T must be reduced by
- (A) $\frac{T}{4}$ (B) $\frac{T}{5}$ (C) $\frac{T}{12}$ (D) $\frac{T}{16}$
43. A spring with 25 active coils cannot be accommodated within a given space. Hence 5 coils of the spring are cut. What is the stiffness of the new spring?
- (A) Same as the original spring (B) 1.25 times the original spring
(C) 0.8 times the original spring (D) 0.5 times the original spring
44. If both the mean coil diameter and wire diameter of a helical compression or tension spring be doubled, then the deflection of the spring close coiled under same applied load will
- (A) be doubled (B) be halved
(C) increase four times (D) get reduced to one-fourth
45. A seamless pipe of diameter d m is to carry fluid under a pressure of $p \text{ kN/cm}^2$. The necessary thickness t of metal in cm, if the maximum stress is not to exceed $\sigma \text{ kN/cm}^2$, is
- (A) $t \geq \frac{pd}{2\sigma} \text{ cm}$ (B) $t \geq \frac{100pd}{2\sigma} \text{ cm}$ (C) $t \leq \frac{pd}{2\sigma} \text{ cm}$ (D) $t \leq \frac{100pd}{2\sigma} \text{ cm}$
46. For the case of a slender column of length L and flexural rigidity EI built in at its base and free at the top, the Euler's critical buckling load is
- (A) $\frac{4\pi^2 EI}{L^2}$ (B) $\frac{2\pi^2 EI}{L^2}$ (C) $\frac{\pi^2 EI}{L^2}$ (D) $\frac{\pi^2 EI}{4L^2}$
47. If diameter of a long column is reduced by 20%, the percentage reduction in Euler's buckling load for the same end is
- (A) 4 (B) 36 (C) 49 (D) 60
48. A circular bar of L m long and d m in diameter is subjected to tensile force of F kN. Then the strain energy, U will be (where, E is the modulus of elasticity in kN/m^2)
- (A) $\frac{4F^2}{\pi d^2} \cdot \frac{L}{E}$ (B) $\frac{F^2}{\pi d^2} \cdot \frac{L}{E}$ (C) $\frac{2F^2}{\pi d^2} \cdot \frac{L}{E}$ (D) $\frac{3F^2}{\pi d^2} \cdot \frac{L}{E}$
49. Elastic limit of cast iron as compared to its ultimate breaking strength is
- (A) Half (B) Double
(C) Approximately (D) None of these

57. When steel containing less than 0.85% carbon is cooled slowly below the lower critical point, it contains
 (A) Ferrite mainly (B) Pearlite mainly
 (C) Ferrite and pearlite (D) Pearlite and cementite
58. Which of the following case hardening processes, result in a change in the composition in a steel component?
 (1) Carburizing (2) Cyaniding
 (3) Nitriding (4) Flame hardening
 (A) 2, 3 and 4 only (B) 1, 3 and 4 only
 (C) 1, 2 and 3 only (D) 1, 2, 3 and 4
59. Which of the following belong to thermoplastics?
 1. Natural resins
 2. Phenol formaldehyde
 3. Polystyrene
 4. Poly vinyl chloride
 (A) 1, 2, 3 and 4 (B) 1, 2 and 3 only
 (C) 1, 3 and 4 only (D) 2, 3 and 4 only

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

List – I		List – II	
(a)	Car dashboard	1.	Poly vinyl chloride (PVC)
(b)	Aircraft pipes	2.	TEFLON
(c)	Conduct pipes	3.	Polyacrylonitrile
(d)	Bearings and gears	4.	Polymethyl–methacrylate

- (A) (a)–3,(b)–4,(c)–2,(d)–1 (B) (a)–2,(b)–4,(c)–1,(d)–3
 (C) (a)–3,(b)–1,(c)–4,(d)–2 (D) (a)–2,(b)–1,(c)–4,(d)–3

61. Which of the following statements is correct for forging?
 (A) Forgability is property of forging tool, by which forging can be done easily
 (B) Forgability decreases with temperature up to lower critical temperature
 (C) Certain mechanical properties of the material are influenced by forging
 (D) Pure metals have good malleability, therefore, poor forging properties
62. Assumptions adopted in the analysis of open die forging are
 1. Forging of friction is constant between work piece and die
 2. Coefficient of friction is constant between work piece and die
 3. Stress in the vertical (Y–direction) is zero.
 (A) 1 and 2 only (B) 1 and 3 only (C) 2 and 3 only (D) 1, 2 and 3

63. Which of the following are correct for an indirect hot extrusion process?
1. Billet remains stationary
 2. There is no friction force between billet and container walls
 3. The force required on the punch is more in comparison to direct extrusion
 4. Extruded parts have to be provided a support
- (A) 1, 2, 3 and 4 (B) 1, 2 and 3 only
(C) 1, 2 and 4 only (D) 2, 3 and 4 only
64. Extrusion process can effectively reduce the cost of product through
- (A) Material saving (B) Process time saving
(C) Saving in tooling cost (D) Saving in administrative cost
65. Which of the following processes is also known as high energy rate forming?
- (A) High velocity forming (B) Explosive fabrication
(C) Electro hydraulic forming (D) Magnetic pulse forming
66. In electrolysis
- (A) For making copper powder, copper plate is made cathode in electrolyte tank
(B) For making aluminum powder, aluminum plate is made anode
(C) High amperage produces powdery deposit of cathode metal on anode
(D) Atomization process is more suitable for low melting point metals
67. The process of making hollow castings of non circular shape and desired thickness by permanent mould without the use of cores is known as
- (A) Die casting (B) Slush casting
(C) Pressed casting (D) Centrifugal casting
68. The ratio of surface area of volume for a unit volume of riser is minimum in case of
- (A) Cylindrical riser (B) Spherical riser
(C) Hemispherical riser (D) Cuboids riser
69. Which of the following factors improve weldability of steel?
1. Low carbon content
 2. High carbon content
 3. Good affinity content
 4. Poor affinity to oxygen
- (A) 1 and 3 (B) 2 and 3 (C) 1 and 4 (D) 2 and 4
70. Brittle welds are mainly obtained due to
- (A) Wrong electrode, faulty preheating and metal hardened by air
(B) Faulty welds, faulty sequence and rigid joints
(C) Wrong speed, current improperly adjusted and faulty preparation
(D) Uneven heat, improper sequence and deposited metal shrinks

78. In Taylor's tool life equation $VT^n = C$, the constants n and C depend upon
1. Work piece material
 2. Tool material
 3. Coolant
- (A) 1, 2 and 3 (B) 1 and 2 only (C) 2 and 3 only (D) 1 and 3 only
79. Tool life increase with increase in
- (A) Cutting speed (B) Nose radius
(C) Feed (D) Depth of cut
80. The most important function of the cutting fluid is to
- (A) Provide lubrication (B) Cool the tool and work piece
(C) Wash away the chips (D) Improve surface finish
81. During orthogonal cutting, an increase in cutting speed causes
- (A) An increase in longitudinal cutting force
(B) An increase in radial cutting force
(C) An increase in tangential cutting force
(D) Cutting forces to remain unaffected
82. Which of the following processes has very high material removal rate efficiency?
- (A) Electron beam machining (B) Electrochemical machining
(C) Electro discharge machining (D) Plasma arc machining
83. Clearance in a fit is the difference between
- (A) Maximum hole size and minimum shaft size
(B) Minimum hole size and maximum shaft size
(C) Maximum hole size and maximum shaft size
(D) Minimum hole size and minimum shaft
84. Rolling horizon in forecast is used for
- (A) Allowing same length of forecast horizon by easily adding a new period when one period is over
(B) Easy updating of changes and maintaining same length of forecast horizon by adding a new period when one period is over
(C) Easy updating of changes and there is no addition of a new period
(D) Different reasons other than the above
85. In an exponentially weighted moving average, the weight of the demand of past periods
- (A) Increases as age of the data increases (B) Increases as age of the data decreases
(C) Decreases as age of the data increases (D) Has no relationship with age of the data

86. The shortest processing time prioritization rule is used for
(A) Reducing a queue size in front of a single server
(B) Reducing work-in-process in a single server system
(C) Reducing average flow time of jobs waiting in front of a server
(D) All of these
87. Which of the following is true with respect to a PERT network?
(A) Activity duration is beta-distributed and project duration is normally distributed
(B) Activity duration is normally distributed and project duration is beta distributed
(C) Activity duration is deterministic and hence project duration is also deterministic
(D) Four time estimates are used for determining average duration of an activity
88. In a quantity discount model of inventory control, the relevant costs are
(A) Annual purchase cost
(B) Annual order cost and annual carrying cost
(C) Annual purchase cost, annual order cost and annual carrying cost
(D) Annual order cost
89. ABC analysis is useful because it
1. Identifies vital few and trivial many
2. Classifies items into three classes
(A) Neither 1 nor 2
(B) Both 1 and 2
(C) 1 only
(D) 2 only
90. In an economic order quantity based inventory control when re-order level is greater than order quantity, the number of orders outstanding at any time is
(A) Never more than one
(B) At least one
(C) No order outstanding
(D) One only
91. The type of schedule inherent in the material requirements planning (MRP) procedure is
(A) Forward schedule
(B) Backward schedule
(C) Both backward and forward schedule
(D) Different from backward and forward schedule
92. In PERT, the distribution of activities times is assumed to be
(A) Normal (B) Gamma (C) Beta (D) Exponential
93. In simplex method, the variables which have not been assigned the value zero during the iteration, are called
(A) Basic variables (B) Actual variables
(C) Artificial variables (D) None of these

94. What will the function `rewind ()` do ?
(A) Reposition the file pointer to a character reverse
(B) Reposition the file pointer to beginning of file
(C) Reposition the file pointer to beginning of line
(D) Reposition the file pointer to beginning of file
95. The time required for the fetching and execution of one simple machine instruction is
(A) Delay time (B) CPU cycle (C) Real time (D) Seek time
96. Which of the following cannot be checked in switch–case statement?
(A) Character (B) Integer (C) Float (D) Enum
97. The keyword used to transfer control from a function back to the calling function is
(A) switch (B) go to (C) goback (D) return
98. If the two strings are identical, then `strcmp ()` function returns
(A) -1 (B) 1 (C) 0 (D) Yes
99. Which bitwise operator is suitable for turning on a particular bit in a number?
(A) & & operator (B) & operator
(C) | | operator (D) | operator
100. By default a real number is treated as a
(A) Float (B) Double (C) Long double (D) None of these
101. What is the purpose of the `flush ()` function?
(A) Flushes all streams and specified streams
(B) Flushes only specified stream
(C) Flushes input/output buffer
(D) Flushes file buffer

Directions: Each of the next nineteen (19) items consists of two statements, one labeled as the ‘Statement(I)’ and the other as ‘Statement (II)’. You are to examine these two statements carefully and select the answers to these items using the codes given below:

Code:

- (a) Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)
(b) Both Statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)
(c) Statement (I) is true but Statement (II) is false
(d) Statement (I) is false but Statement (II) is true

102. **Statement (I)** : Method of obtaining different mechanisms by fixing in turn different links in a kinematic chain is known as inversion
Statement (II) : Scotch Yoke mechanism is an inversion of a double slider crank mechanism
103. **Statement (I)** : Generally, for larger size pulleys. Curved arms are used
Statement (II) : Curved arms are less liable to fracture from internal stresses set-up due to unequal rates of cooling of the hub and the rim
104. **Statement (I)** : Mohr' s circle of stress can be related to Mohr' s circle of strain by some constant of proportionality
Statement (II) : The relationship is a function of yield strength of the material
105. **Statement (I)** : Ductile materials generally absorb more impact energy than the brittle materials.
Statement (II) : Ductile materials generally have higher ultimate strength than brittle materials
106. **Statement (I)** : Steel reinforcing bars are used in reinforced cement concrete
Statement (II) : Concrete is weak in compression
107. **Statement (I)** : If the bending moment along the length of a beam is constant, then the beam cross-section will not experience any shear stress.
Statement (II) : The shear force acting on the beam will be zero everywhere along its length
108. **Statement (I)** : It is difficult to maintain close tolerance in normal forging operation
Statement (II) : Forging is workable for simple shapes and has limitation for parts having undercuts
109. **Statement (I)** : Parts made by powder metallurgy do not have as good physical properties as parts casted.
Statement (II) : Particle shape in powder metallurgy influences the flow characteristic of the powder
110. **Statement (I)** : Cupola furnace is not employed for melting steel in foundry
Statement (II) : The temperatures generated within a cupola are not adequate for melting steel
111. **Statement (I)** : In gas welding the metal to be joined gets oxidized or carburized
Statement (II) : The neutral flame affects no chemical change on the molten metal

112. **Statement (I)** : DC with reverse polarity is used in MIG welding
Statement (II) : Use of DC with reverse polarity enables deeper penetration and a clean surface
113. **Statement (I)** : Hydrogen induced cracking occurs in the heat effected zone adjacent to fusion zone and classified as solid state cracking
Statement (II) : Hydrogen from burning of flux coating penetrates martensitic micro cracks preventing healing as well as enlarging them.
114. **Statement (I)** : Honing is an abrading process to remove stock from metallic surfaces
Statement (II) : Honing is commonly done on internal surfaces
115. **Statement (I)** : Vibrations in milling are induced due to interrupted cutting operation
Statement (II) : Vibrations can be suppressed to a large extent by using equal spacing of teeth along the periphery of the cutters
116. **Statement (I)** : Negative rake angles are preferred on rigid set-ups for interrupted cutting and difficult-to machine materials.
Statement (II) : Negative rake angle directs the chips on to the machined surface
117. **Statement (I)** : In Electro Discharge Machining (EDM) process, tool is made cathode and work piece anode
Statement (II) : In this process if both electrodes are made of same material, greatest erosion takes place upon anode
118. **Statement (I)** : The knowledge about the nature of time series components is required for better forecasting
Statement (II) : Moving average and simple exponential smoothing models are used for time series demand forecasting but they are suitable for average demand process
119. **Statement (I)** : A two-machine n-job sequencing problem with all jobs having same machine sequence is an example of sequencing problem in a flow shop
Statement (II) : All the flow shop problems can be optimally sequenced to minimize make span using Johnson's rule
120. **Statement (I)** : Low level code is used for record processing of items in the material requirement planning (MRP).
Statement (II) : Low level code helps in transferring all the requirements from the parents of the item in a single record processing step