CIVIL ENGINEERING

(PAPER–I)

1. The timber preservative "creosote" belongs to the group of
   a. Water soluble salts
   b. Organic solvent type
   c. Tar oil type
   d. Inorganic solvent type

2. The strength of timber is maximum in a direction
   a. Parallel to the grains
   b. Perpendicular to the grains
   c. 45^0 to the grains
   d. 30^0 to the grains

3. When a I^{st} class brick is immersed in cold water for 24 hours, it should 1101 absorb water by weight more than
   a. 15%
   b. 20%
   c. 25%
   d. 30%

4. Match List-I with List-II and select the correct answer using the code given below the Lists:

   List - I (Species)

   A. Babul
   B. Ben teak
   C. Bijsal
   D. Mulbury

   List-Il (Uses)

   1. Tennis rackets (sports goods)
   2. Boats
   3. Agricultural tools
   4. Furniture

	A	B	C	D
a.	4	1	3	2
b.	3	2	4	1
c.	4	2	3	1
d.	3	1	4	2

5. The temperature at which the bricks are burnt in kiln vanes from
   a. 500° to 8000 C
   b. 800° to 10000 C
   c. 1000° to 1200° C
   d. 1200° to 1500° C

6. Match List-I with List-II and select the correct answer using the code given below the Lists :

   List-I (Job Requirement)

   A. High early strength
   B. Lining for canals
   C. Frost and acid resistance
   D. Marine Structure

   List-II (Type of Cement Binder)

   1. Pozzolanic cement
   2. Rapid hardening
   3. Sulphate resisting
   4. High Alumina

	A	B	C	D
a.	1	4	3	2
b.	2	3	4	1
c.	1	3	4	2
d.	2	4	3	1

7. As per specifications, the initial setting time of ordinary Portland cement should not be less than
   a. 10 minutes
   b. 20 minutes
   c. 30 minutes 60 minutes

8. In cements, generally the increase in strength during a period of 14 days to 28 days is primarily due to
   a. C_3A
   b. C_2S
   c. C_3S
   d. C_4AF

9. What is the approximate ratio of the strength of cement concrete at 7 days to that at 28 days' curing ?
   a. 0.40

b. 0.65

c. 0.90

d. 1.15

10. Which one of the following properties of cement concrete is ascertained by conducting compaction factor test ?

a. Bulk density

b. Compressive strength

c. Modulus of rupture

d. Workability

11. As per IS 456—2000, which one of the following correctly expresses the modulus of elasticity of concrete ? (read with the relevant units)

a. $E_e = 0.7\sqrt{f_{ck}}$

b. $E_e = 500\sqrt{f_{ck}}$

c. $E_c = 5000\sqrt{f_{ck}}$

d. $E_c = 5700\sqrt{f_{ck}}$

12. The mix design for pavement concrete is based on

a. The flexural strength

b. The characteristic compressive strength

c. The shear strength

d. The bond strength

13. If G is the modulus of rigidity, E the modulus of elasticity and μ the Poisson's ratio for a material, then what is the expression for G?

a. $G = \frac{3E}{2(1+2\mu)}$

b. $G = \frac{5E}{(1+\mu)}$

c. $G = \frac{E}{2(1+\mu)}$

d. $G = \frac{E}{(1+2\mu)}$

14. A thin cylinder of thickness 't', width 'b' and internal radius 'r' is subjected to a pressure 'p' on the entire internal surface. What is the change in radius of the cylinder ? (μ is the Poission's ratio and E is the modulus of elasticity)

a. $\frac{p^2 r(2-\mu)}{Et}$

b. $\frac{pr^2(2-\mu)}{Et}$

c. $\frac{pr^2(2-\mu)}{2Et}$

d. $\frac{p(1-\mu)}{Et^2}$

15. A bar of 40 mm diameter and 400 mm length is subjected to an axial load of l00 kN. It elongates by 0.150 mm and the diameter decreases by 0.005 mm. What is the Poission's ratio of the material of the bar ?

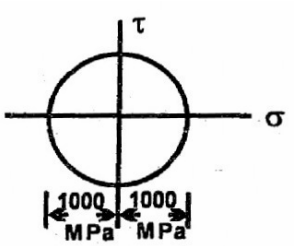
a. 0.25

b. 0.28

c. 0.33

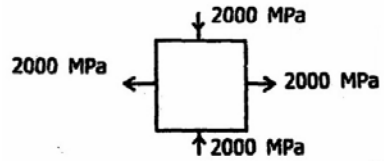
d. 0.37

16.

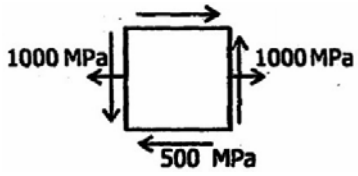


The Mohr's circle given above corresponds to which one of the following stress conditions

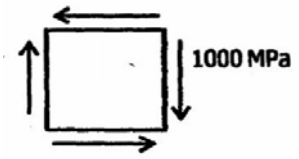
a.



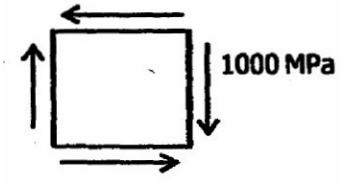
b.



c.



d.



17. Match List — I with List — II and select the correct answer (σ = direct stress, τ = shear stress, M_x = Bending moment, E = Modulus of elasticity, G = Modulus of rigidity, I = Area moment of inertia, V Volume)

List–I (Strain Energy)

A. $\frac{\sigma^2 v}{2E}$

B. $\frac{\tau^2 v}{2G}$

C. $\frac{\tau^2 v}{4G}$

D. $\int_0^L \frac{M^2 \times dx}{2EI}$

List II (Gradually Applied Load)

1. Axial load
2. Bending Load
3. Shear load
4. Torsional load

	A	B	C	D
a.	2	3	4	1
b.	l	4	3	2
c.	2	4	3	1
d.	l	3	4	2

18. If the maximum principal stress for an element under bi—axial stress situation is 100 MPa (tensile) and the maximum shear stress is also 100 MPa, then what is the other principal stress?

a. 200 MPa (tensile)
b. 200 MPa (compressive)
c. 100 MPa (compressive)
d. 0

19. A thin cylindrical tube closed at ends is subjected to internal pressure. A torque is also applied to the tube. The torque is also applied to the tube. The principal stresses p_1 and p_2 developed are 80.0 units and 20.0 units respectively. If the yield stress is 240 units, then what is the factor of safety according to Maximum shear stress theory?

a. 3.00
b. 4.00
c. 5.00
d. 6.00

20. If p_1 and p_2 are the principal stresses at a point in a strained material with Young's modulus E and Poisson's ratio 1/rn, then what is the principal strain ?

a. $\frac{p_1 + p_2}{mE}$

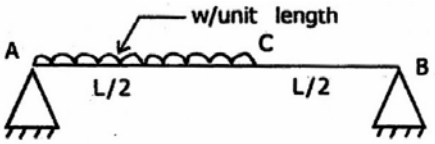
b. $\frac{p_1 - p_2}{mE}$

c. $\frac{p_1}{E} - \frac{p_2}{mE}$

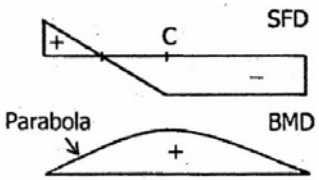
d. $\frac{p_1}{E} + \frac{p_2}{mE}$

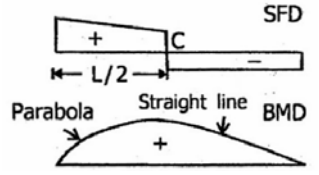
21. In a two-dimensional stress system, the two principal stresses are p_1 = 180 N/mm^2 (Tensile), and p_2 which is compressive. For the material, yield stress in simple tension and compression is 240 N/mm^2 and Poisson's ratio is 0.25. According to maximum normal strain theory, for what values of p_2 , shall yielding commence?

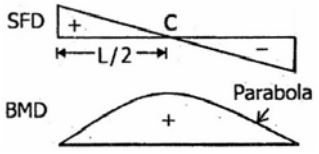
a. 240 N/mm^2
b. 180 N/mm^2
c. 195 N/mm^2
d. 200 N/mm^2

22. 

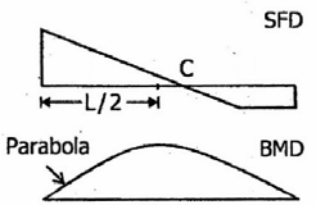
A simply supported beam AB has span L as shown in the figure above, Point C is the mid—span of the beam. It is subjected to u.d.l. w/unit length, in the portion A to C. Which of the following are the SFD and BMD for the beam ?

a. 

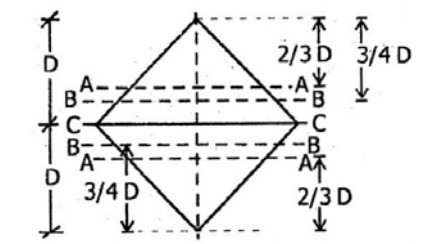
b. 

c. 

d.



23.



A beam of square cross section is placed horizontally with one diagonal horizontal as shown in the figure above. It is subjected to a vertical shear force acting along the depth of the cross section. Maximum shear stress across the depth of cross section occurs at a depth x from the top. What is the value of x?

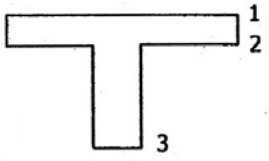
a. x = 0

b. x = (2/3) D

c. x(3/4)D

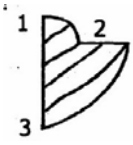
d. D

24.

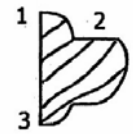


Which one of the following diagrams indicates the shear stress distribution for the beam as shown in the figure above?

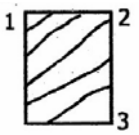
a.



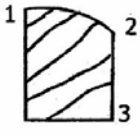
b.



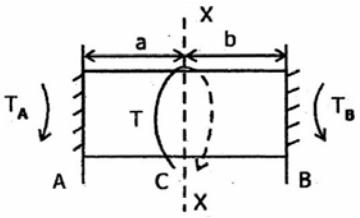
c.



d.



25.



For the circular shaft AB, as shown in the figure above, a torque 'T' is applied at the section XX at C, such that b/a = 1.5. The shaft is uniform in section. What is the ratio of T_A/T_B?

a. 3

b. 1.5

c. 0.67

d. 0.5

26. The failure surface of a standard cast iron torsion specimen, subjected to a torque is along

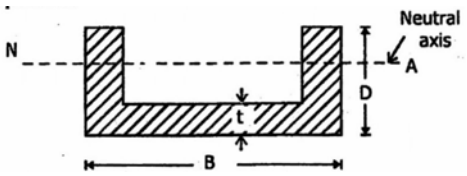
a. the surface helicoidal at 450 to the axis of the specimen

b. the curved surface at the grips

c. the plane surface perpendicular to the axis of the specimen

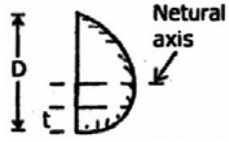
d. the curved surface perpendicular to the axis of the specimen

27.

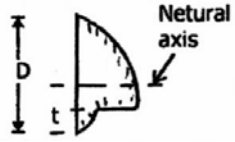


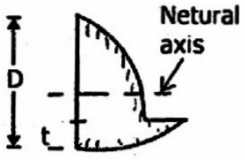
A horizontal beam shown in the figure given above is subjected to transverse loading. Which one of the following diagrams represents the distribution of shear force along the cross—section ?

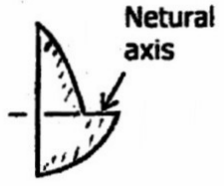
a.

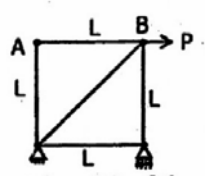


b.



c. 

d. 

28. 

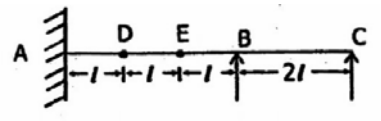
What is the force in number AB of the pin—jointed frame as shown above ?

a. P (Tension)

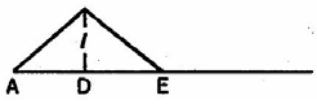
b. P (Compression)

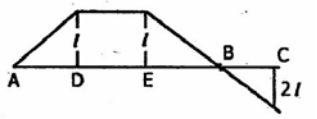
c. P / $\sqrt{2}$ (Compression)

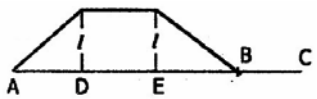
d. Zero

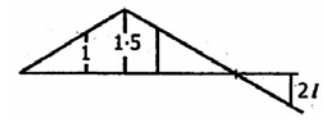
29. 

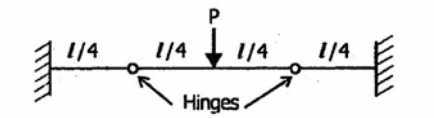
Which one of the following diagrams corresponds to the influence line diagram for moment at A of the beam shown above in the figure?

a. 

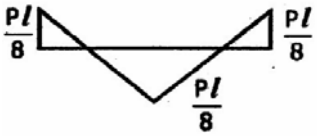
b. 

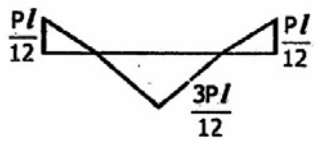
c. 

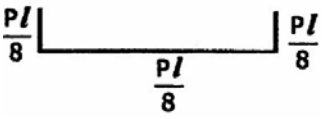
d. 

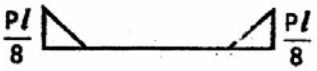
30. 

Which one of the following is the correct BMD for the loaded uniform sized beam as shown in the figure given above?

a. 

b. 

c. 

d. 

31. Consider the following statements

1. Even though a three—hinged parabolic arch is subjected only to vertical loads, it generates horizontal reactions and axial forces.
2. A cable uniformly loaded along the horizontal span assumes the shape of a parabola, whereas a cable uniformly loaded along its length takes the shape of a catenary.
3. Cables loaded uniformly along the horizontal span are by far the types most commonly used structures in practice.

Which of the statements given above is/are correct ?

a. Only 1

b. Only 2 and 3

c. Only 1 and 2

d. 1, 2 and 3

32. Match List-I with List-II and select the correct answer using the code given below the Lists :

List-I (Loading Condition)

A. Cantilever with concentrated load W at end

B. Cantilever with udi (w/unit length) across the complete span (W = wl)

C. Simply supported beam with concentrated load W at the centre

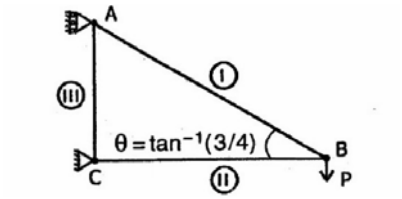
D. Simply supported beam with udl (w/unit length) across complete span (W=wl)

List-II Maximum Slope)

1. $W1^2/16$ El
2. $W1^2/24$ El
3. $W1^2/2$ El
4. $W1^2/6$ El

	A	B	C	D
a.	1	2	3	4
b.	3	4	1	2
c.	l	4	3	2
d.	3	2	1	4

33.



A cantilever truss carries a concentrated load P as shown in the figure above. What are the magnitudes of axial forces in the members I, II and III, respectively?

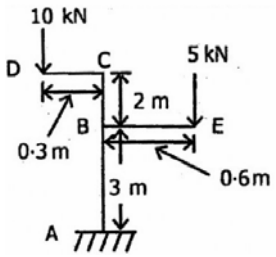
a. 1.00P, 1.33P & 1.67P

b. l.67P, l.33P& l.00P

c. 1.33 P, 0.75 P & 1.60 P

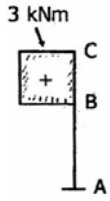
d. 0.60 P. 0.75 P & 1.0 P

34.

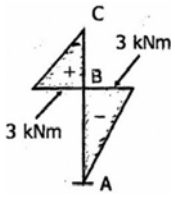


Which one of the following is the bending moment diagram for the vertical cantilever beam loaded as shown in the figure above?

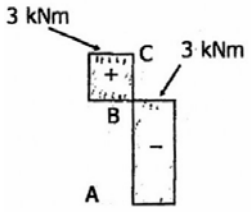
a.



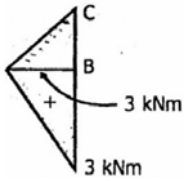
b.



c.



d.



35. Consider the following statements :

Williot-Mohr diagram is used to determine the deflection in

1. an arch.
2. a truss.
3. a rigid frame.

Which of the statements given above is/are correct ?

a. Only 1

b. Only 2

c. Only 3

d. 1, 2 and 3

36. A propped cantilever AB, with fixed edge A is propped at B and carries uniformly distributed load over the entire span. If the prop heaves up (displaces upward), which one among the following is true if prop reaction = R_B, Moment at A = M_A?

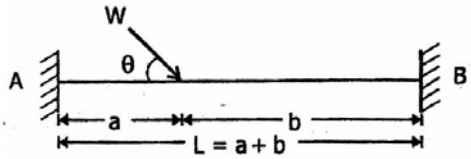
a. Both R_B and M_A will increase

b. R_B will increase, M_A will decrease

c. R_B will decrease, M_A will increase

d. Both R_B and M_A will decrease

37.



For the fixed beam as shown in the figure above, what is the fixed end moment at A for the given loading?

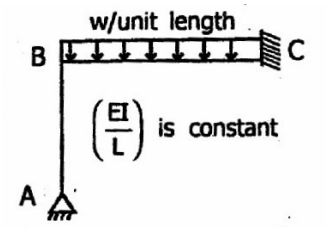
a. $\frac{Wab^2}{L^2}\cos^2\theta$

b. $\frac{Wa^2b}{L^2}\cos^2\theta$

c. $\frac{Wab^2}{L^2}\cos\theta$

d. $\frac{Wa^2b}{L^2}\cos^2\theta$

38.



What is the ratio of magnitudes of moments in the member BC at the ends B and C in the figure given above?

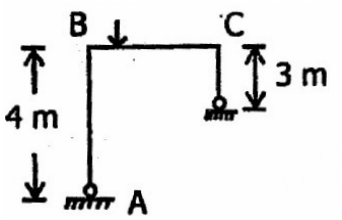
a. 1 : 1

b. 3 : 1

c. 3 : 4

d. 1 : 3

39.



For the frame as shown in the figure above, the final end moment MDC has been calculated as — 40 kNm. What is the end moment MCD?

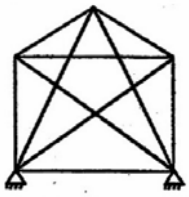
a. +40 kNm

b. —40 kNm

c. +30 kNm

d. —30 kNm

40.



What is the degree of static indeterminacy of the plane structure as shown in the figure above ?

a. 3

b. 4

c. 5

d. 6

41. Consider the following statements

Hardy Cross method of moment distribution can be applied to analyse

1. Continuous beams including non—prismatic structures.
2. continuous beams with prismatic elements.
3. structures with intermediate hinges.
4. rigid frames.

Which of the statements given above are correct ?

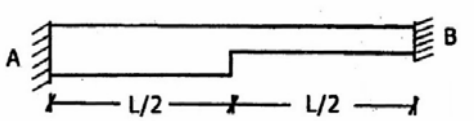
a. 1, 2, 3 and 4

b. Only 1, 2 and 3

c. Only 1, 2 and 4

d. Only 3 and 4

42.



What is the carry—over factor from A to B while using moment distribution for analysing beam as shown in the figure given above ?

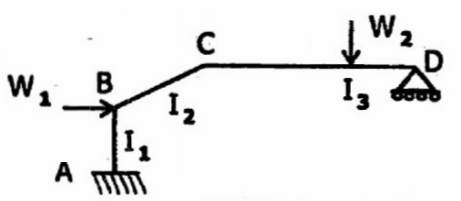
a. 1/2

b. 1.0

c. < 1/2

d. > 1/2

43.



The rigid plane frame ABCD has to be analysed by slope deflection method. What is the number of unknown displacements / rotations for the frame as shown in the figure given above ?

a. 4

b. 3

c. 5

d. 2

44. Consider the following statements regarding the analysis of indeterminate structures

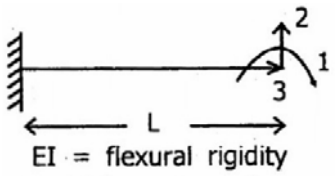
1. The force method consists in applying displacement compatibility conditions at the nodes.

2. The stiffness method consists in formulating equilibrium equations at the nodes.

Which of the statements given above is/are correct ?

a. Only 1
b. Only 2
c. Both 1 and 2
d. Neither 1 nor 2

45.



What is the stiffness matrix for a prismatic cantilever with coordinates as shown in figure ?

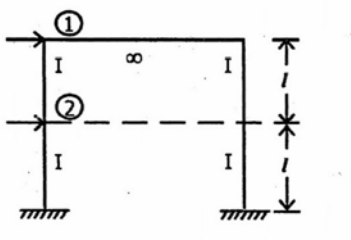
a. $\begin{bmatrix} \frac{AE}{L} & 0 & 0 \\ 0 & \frac{4EI}{L} & \frac{6EI}{L^2} \\ 0 & \frac{6EI}{L^2} & \frac{12EI}{L^3} \end{bmatrix}$

b. $\begin{bmatrix} 0 & 0 & \frac{AE}{L} \\ 0 & \frac{4EI}{L} & \frac{6EI}{L^2} \\ 0 & \frac{6EI}{L^2} & \frac{12EI}{L^3} \end{bmatrix}$

c. $\begin{bmatrix} \frac{AE}{L} & \frac{4EI}{L} & 0 \\ 0 & 0 & 0 \\ 0 & \frac{6EI}{L^2} & \frac{4EI}{L} \end{bmatrix}$

d. $\begin{bmatrix} \frac{AE}{L} & \frac{4AE}{L} & \frac{6EI}{L^2} \\ 0 & \frac{6EI}{L^2} & 0 \\ 0 & \frac{6EI}{L^3} & \frac{12EI}{L^3} \end{bmatrix}$

46.



The beams in the two storey frame shown in the figure above have a cross section such that the flexural rigidity may be considered infinite. Which among the following is the stiffness matrix for the structure in respect of the global coordinates 1 and 2?

a. $\frac{24EI}{\ell^3}\begin{bmatrix} 1 & -1 \\ -1 & 2 \end{bmatrix}$

b. $\frac{24EI}{\ell^3}\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$

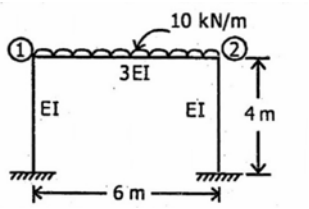
c. $\frac{24EI}{\ell^3}\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$

d. $\frac{24EI}{\ell^3}\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

47. What is the total strain energy of a member subject to an axial stress f (E = Young's modulus)

a. $(f^2/2E) \times$ volume of bar
b. $(f/E) \times$ volume of bar
c. $(f^2/E) \times$ volume of bar
d. $(f/2E) \times$ volume of bar

48.



Considering only flexural deformations, which is the stiffness matrix for the plane frame shown in the figure given above?

a. $\begin{bmatrix} 4 & 3 \\ 3 & 4 \end{bmatrix} EI$

b. $\begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix} EI$

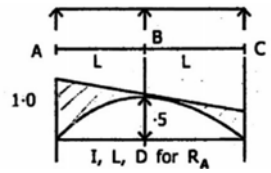
c. $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix} EI$

d. $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} EI$

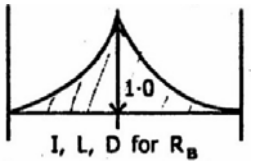
49. Consider the following statements

1. Muller—Bresiau's principle is applicable only to indeterminate structures
2. Muller—Breslau's principle is applicable only to determinate structures
3. Muller—Breslau's principle is applicable to both determinate and indeterminate structure
4. For a two span Continuous beam ABC, the influence line diagrams is/are

(i)



(ii)



Which of the statements given above are correct ?

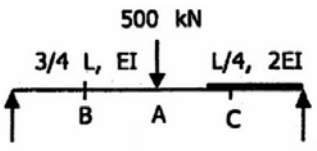
a. 1 and 4(ii)

b. 3 and 4(i)

c. 2 and 4(i)

d. 3and4(ii)

50.



A load 500 kN applied at point A, as shown in the figure above, produces a vertical deflection at P and C of the beam as Δ_b = 10 mm and Δ_b = 15 mm respectively. What is the deflection at A when loads of 100 kN and 300 kN are applied at B and C. respectively?

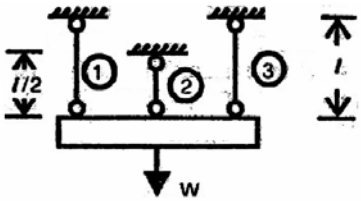
a. 6mm

b. 8mm

c. 11mm

d. 12.5 mm

51.



Three wires of steel 1, 2 and 3, each having area 'A' support load W. What is the ratio between collapse load and the load corresponding to yielding of, on of the wires?

a. 3 : l

b. 3 : 2

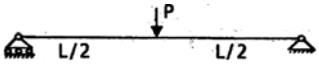
c. 3 : 3

52. Match List – I with List–II and se1ect the correct answer using the code given below the Lists :

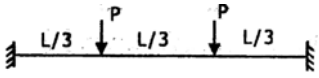
List I

(Loaded prismatic beam of uniform M_p)

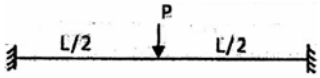
A.



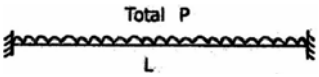
B.



C.



D.



List – II(Plastic Load)

1. 4 Mp/L
2. 16 Mp/L
3. 6 Mp/L
4. 8 Mp/L

	A	B	C	D
a.	4	3	1	2
b.	l	2	4	3
c.	4	2	1	3
d.	l	3	4	2

53. A beam of square cross—section of side x is composed of material whose yield stress in compression is 1.5 times the yield stress in the tension. What is the distance of the neutral axis from the centre for the fully plastic condition?

a. 0.1 x

b. 0.15 x

c. 0.2 x

d. 0.25 x

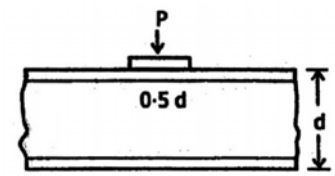
54. Which one of the following is not correct?

a. The shape factor for any section is equal to Mp/My
b. For a thin—web wide—flange beam, shape factor is close to unity
c. For a circular section, shape factor is nearly 1.7
d. Shape factor for an I—section sometimes may be more than that for a rectangular section

55. What is the ratio of the shape factors for beam cross—sections having rectangular, circular and triangular shapes and of same area?

a. 1.00 : 0.73 : 0.64
b. 1.00 : 0.88 : 1.38
c. 1.00 : 1.13 : 1.56
d. 1.00 : 1.56 : 1.13

56.

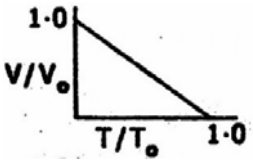


A plate girder of depth d bears a concentrated load P through a distribution plate of width 0.5 d as shown in the figure. If the maximum allowable critical buckling stress is calculated as f, what is the value of P ? Web plate thickness = t

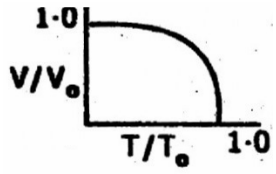
a. 0.5 dt f
b. 1.0 dtf
c. 1.5 dt f
d. 2.0 dt f

57. A bolt is subjected to shear force V and tension T. The capacity of the bolt in resisting shear and tension respectively are V_0 and T_0. Which one of the following diagrams represents interaction relations?

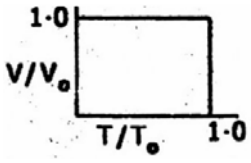
a.



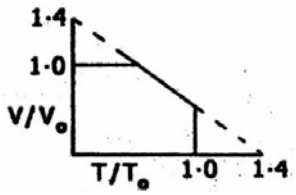
b.



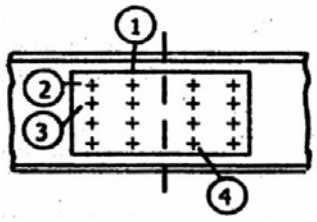
c.



d.



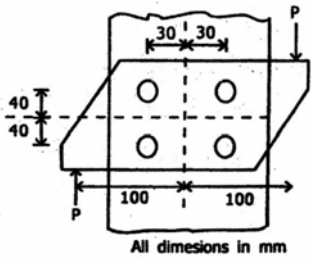
58.



Which one of the bolts in a web splices of a plate girder as shown in the figure is stressed maximum?

a. Bolt — 1
b. Bolt — 2
c. Bolt- 3
d. Bolt—4

59.



A bracket has been attached to flange of a column as shown in the figure. What is the maximum force in the bolt ?

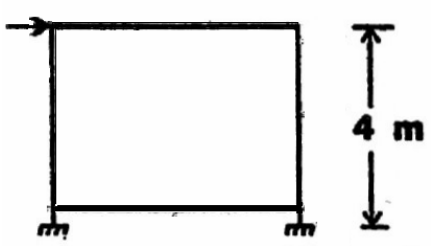
a. P/4
b. P/2
c. P
d. 2P

60. An equal angle of area A has been attached to the support by means of a lug angular. If allowable stress in tension is f, what is the load carrying capacity of the member ?

a. 0.5 fA
b. 0.85 fA
c. 0.9 fA
d. 1.0 fA

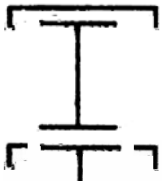
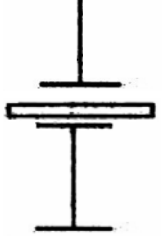
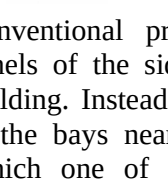
61. What is the maximum slenderness ratio permitted as per IS 800-1984 of design of a tie member subjected to reversal of stress due to earthquake ?
    a. 180
    b. 250
    c. 300
    d. 350

62. A welded plate girder has web plate 1500 6 mm. which one of the following is correct about stiffening the web ?
    a. The web is left unstiffened
    b. The web is provide with vertical stiffeners only
    c. The web is provided with vertical stiffeners and a horizontal stiffener at 0.4 from the top flange
    d. The web is provided with vertical stiffener and two rows of horizontal stiffeners, on e at 0.4 d form the top flange and another at the mid height of the web.

63. 

An industrial portal frame shown has weak floor beams. What is the effective length of column ?
    a. 3 m
    b. 4 m
    c. 6 m
    d. 8 m

64. Which one of the following section sis the most efficient for a simply supported gantry girder ?
    a. I-section with equal flanges
    b. I-section with a channel attached to the top flange
    c. I-section with a wide bottom flange
    d. I-section with a heavy plate connected to the bottom flange

65. A laterally unsupported compression flange of beam has been strengthened by channel, angle and plates as shown. Areas of all the members added are equal. Which one of the following options will yield higher allowable stress ?
    a. 
    b. 
    c. 
    d. 

66. Conventional practice is to brace end panels of the side walls of an industrial building. Instead bracing can be provided in the bays near centre of the building. Which one of he following reasons is correct ?
    a. Wind pressure at the mid length is higher compared to ends
    b. Trusses are erected starting from the ends of the building
    c. Fixing the bracings to end gables is convenient
    d. Free change of length between centre and the ends of the building is possible in mid-span bracing.

67. What is the maximum permissible slenderness ratio of a major compression number with undergoes reversal of stress due to wing load ?
    a. 180
    b. 250
    c. 300
    d. 400

68. Which one among the following is the correct ratio of effective length to actual length of a discontinuous angle strut, if ends are welded ?
    a. 0.65
    b. 0.85
    c. 1.0

d. 1.2

69. A fixed beam of length *l* has been loaded with central concentrated load. The beam has been strengthened at the supports with cover plates so that the flexural resisting yield moment capacity at the ends is thrice of that at the centre. If this capacity is to be fully effective resulting in higher collapse load, to what length from the ends should the cover plate extend?

a. *l*/3

b. *l* /4

c. *l* /6

d. *l* /8

70. In the case of a tension member consisting of two angles back to back on the same side of gusset plate, what is k equal to? (Area of connected leg = A_1, Area of outstanding leg = A_2)

a. $\frac{3A_1}{3A_1 + A_2}$

b. $\frac{3A_1}{A_1 + 3A_2}$

c. $\frac{5A_1}{A_1 + 5A_2}$

d. $\frac{5A_1}{5A_1 + A_2}$

71. Which one of the following is the correct maximum shear capacity of a prismatic beam under plasting design of steel structures ?

a. $0.5\ A_wF_y$

b. $0.55\ A_wF_y$

c. $0.75\ A_wF_y$

d. A_wF_y

(where A_w and F_y,, are web area and yield stress, respectively)

72. Characteristic strength of M20 concrete is 20 MPa. What the number of cubes having 28 days's compressive strength greater than 20 MPa out of 100 cubes made with the concrete?

a. All

b. 95

c. 80

d. 50

73. The distance between theoretical cut—off point and actual cut—out point in respect of the curtailment of reignforcement of reignforced concrete beams should not be less than

a. Development length

b. 12 × dia of bar or effective depth whichever is greater

c. 24 × dia of bar or effective depth whichever is greater

d. 30 × dia of bar or effective depth whichever is greater

74. The maximum strain in the tension reinforcement in the section at failure when designed for the limit state of collapse should be

a. $> \left(\frac{f_y}{1.15E_s} + 0.002\right)$

b. $< \left(\frac{f_y}{1.15E_s} + 0.002\right)$

c. exactly equal to $\left(\frac{f_y}{1.15E_s} + 0.002\right)$

d. < 0.002

Where, f_y = Characteristic strength of steel,

and E_s = Modulus of elasticity of steel

75. The final & reflection due to all including effects of temperature, creep and shrinkage measured from as—cast level of the supports of floors, roofs and all other horizontal members of reinforced concrete should not normally exceed

a. Span / 350

b. Span / 250

c. (Span I 350) or 20 mm whichever is less

d. (5/348) of span

76. Shear strength of concrete in a reinforced concrete beam is a function of which of the following:

1. Compressive strength of concrete
2. Percentage of shear reinforcement
3. Percentage of longitudinal reinforcement in tension in the section
4. Percentage total longitudinal reinforcement in the section

Select the correct answer using the code given below

a. l, 2 and 4

b. l, 2 and 3

c. Only 1 and 3

d. Only 1 and 4

77. An axially loaded column is of 300 x 300 mm size. Effective length of column is 3 m. What is the minimum eccentricity of the axial load for the column?

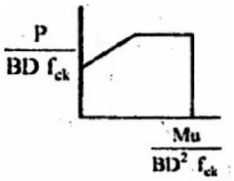
a. 0

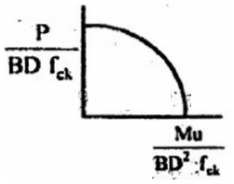
b. 10mm

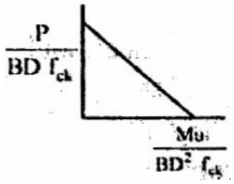
c. 16 mm

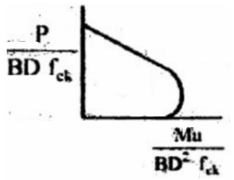
d. 20 mm

78. A rectangular reinforced column (B x D) has been subjected to uniaxial bending moment M and axial load P. Characteristic strength of concrete = f_{ck}. Which one amone the following column design curves shows the relation between M and P qualitatively?

a. 

b. 

c. 

d. 

79. In the case of isolate square concrete footing, match the locations at which the stress resultants are to be checked where d is effective depth of footing and select the correct answer using the code given below the lists

Stress Resultant

A. Bending moment

B. One way shear

C. Punching shear

Location

1. At face of columns
2. At d/2 from face of column
3. At d from face of column

	A	B	C
a.	1	2	3
b.	3	1	2
c.	1	1	3
d.	1	2	3

80. A beam is designed for uniformly distributed loads causing compression in the supporting columns. Where is the critical section for shear? (d is effective depth of beam the L_d is development length)

a. A distance $L_d/3$ from the face of the support

b. A distance d from the face of the. support

c. At the centre of the support

d. At the mid span of the beam

81. As per codal provisions in two way slabs, the minimum mild steel reinforcement to be provided in the edge strip is

a. On the basis of minimum bending moment

b. Half of the area of steel provided in middle strip in the shorter span

c. Half of the area of steel provided m middle strip in the longer span

d. 0.15 % of the cross–sectional area of concrete.

82. An R.C. structural member rectangular in, cross section of width b and depth D is subjected to a combined action of 1bendin; moment M and torsional moment T. The longitudinal reinforcement ha1l be designed for moment Me given by

a. $Me = M + \dfrac{T(1+D/b)}{1.7}$

b. $Me = M + \dfrac{T(1-b/D)}{1.7}$

c. $Me = \dfrac{T(1-D/b)}{1.7}$

d. $Me = \frac{T(1-b/D)}{1.7}$

83. A T—beam roof section has the following particular :

Thickness of slab = 100mm

Width of rib = 300mm

Depth of beam = 500mm

Centre to centre distance of beams = 3.0 m

Effective span of beams = 6.0

Distance between points of contra-flexure = 3.6 m

What is the effective flange width of the T–beam ?

a. 3000 mm

b. 1900 mm

c. 1600 mm

d. 1500 mm

84. At T—beam behaves as a rectangular beam of width equal to its flange if its neutral, axis

a. coincides with centroid of reinforcement

b. coincides with centroid of T—section

c. remains within the flange

d. remains in the web

85. The profile of the centroid of the tendon is parabolic with a central dip h. Effective prestressing force is. P and the span ℓ. What is the equivalent upward acting uniform load?

a. $8h\ \ell/P$

b. $8hP/\ell^2$

c. $8h^2\ \ell/P$

d. $8b^2\ P/\ell$

86. What is the uplift at centre on release of wires from anchors due to pretensioning only for force P and eccentricity e for a pre—tensioned rectangular plank ?

a. $PeL^2/6EI$

b. $Pe^2L/6EI$

c. $PeL^2/8EI$

d. $Pe^2/8EI$

87. An ordinary mild steel bar has been prestressed to a working stress of 200 MPa. Young's modulus of steel is 200 GPa. Permanent negative strain due to shrinkage and creep is 0.0008. How much is the effective stress left in steel ?

a. 184 MPa

b. 160 MPa

c. 40 MPa

d. 16 MPa

88. Which one of the following is the correct statement?

Prestressing anchorage units using multiple wire cables exist in the

a. Freyssinet system

b. Lee—McCall system

c. Gifford—Udall system

d. Hoyer system

89. Match List — I with List — II and select the correct answer using the code given below the Lists :

List - I (Post Tensioning System)

A. Freyssinet

B. Gifford—Udall

C. Lee—McCall

D. Magnel—Blaton

List-II

(Arrangement of Tendons in the Duct)

1. Single bars
2. Wires evenly spaced by perforated spacers
3. Horizontal rows of four wires spaced by metal grills
4. Wires spaced by helical wire core in annular spacer

	A	B	C	D
a.	4	1	2	3
b.	3	2	1	4
c.	4	2	1	3
d.	3	1	2	4

90. A pre–stressed concrete beam of cross–sectional area A, moment of inertia 'I', distance of top extreme fibre from neutral axis 'y_t', and distance of bottom extreme fibre from neutral axis 'Y_b'; is subjected to pre—stressing force such that stress at top fibre is zero. What is the value of eccentricity (r is radius of gyration):

a. A/y_b

b. r^2/y_b

c. r^2/y_t

d. ry_b/y_t

91. Concordant cable profile is

a. A cable profile that produces no support reactions due to pre-stressing

b. A cable profile which is parabolic in nature

c. A cable profile which produces no bending moment at the supports of a beam

d. A cable profile laid corresponding to axial stress diagram

92. For a pre—stressed concrete continuous beam subject to different load combinations, which one of the following is correct for concordant cable profile?

a. It is not unique, but located in a narrow zone

b. It is unique

c. It is selected as compromise between secondary stresses and working stresses

d. It is selected based on deflection profile

93. A masonry wall has height 'h', length 'L' and thickness 't'. The allowable stress based on slenderness is calculated on the basis of

a. h/t only

b. L/t only

c. Lesser of L/t and h/t

d. Greater of L/t and h/t

94. The net effect of vertical and lateral forces acting on a masonry wall can be expressed as vertical load 'p'/unit length acting at an effective eccentricity 'e'. If e > (t/6), tension develops in the wall. Ignoring in the part of thickness 't' in tension, what is the compressive stress in extreme fibre?

a. p/{(t/2)–e}

b. [2p/3 {(t/2)–e}]

c. [p/3 {(t/2)–e}]

d. [p/6 {(t/2)–e}]

95. Which one of the following is not a factor affecting strength of a brick masonry wall?

a. Size and location of door in a wall

b. Positioning of cross walls

c. Type of roof the wall bears and its connection

d. Type of plastering on the wall

96. Consider the following statements :

A mixer designated 400 NT indicates that

1. it is non-tilting type mixer
2. its nominal mix batch capacity is 400 litres
3. it requires 300 revolutions for proper mixing of the batch using one bag of cement

which of the statements given above are correct ?

97. Transportation of concrete-mix by pumps is very convenient method, particularly in case of

a. Housing complex

b. Cement concrete pavement

c. Low rise buildings

d. Tunnel–lining

98. What is the correct sequence of operations involved in concrete production?

a. Batching–Mixing–Handling–Transportation

b. Mixing–Batching–Handling–Transportation

c. Transportation–Handling–Mixing–Batching

d. Handling–Transportation–Mixing–Batching

99. Match List–I with List–II and select the correct answer using the code given below the Lists :

List-I(Type of work)

A. To dig trenches, footings or basement where the precise control of depth is required

B. To handle loose materials such as sand, gravel, coal, etc.

C. To excavate all classes of earth except the rock & load it into the trucks

D. To excavate the earth from a canal an to be deposited on nearby banks

List–II(Type of Machine)

1. Clam shells
2. Power shovel
3. Back hoe
4. Scraper
5. Drag line

A B C D

a. 3 5 2 1

b. 2 1 4 5

c. 3 1 2 5

d. 2 5 4 1

100. Which of the following are the advantages of crawler mounted bulldozer over wheel mounted bulldozers ?

1. Higher travel speed
2. Able to travel over very soft soil
3. Able to travel over very rough surfaces having no haul roads

Select the correct answer using the codes given below :

a. 1, 2 and 3

b. Only 1 and 2

c. Only 1 and 3

d. Only 2 and 3

101. Consider the following statements associated with critical path :

1. Critical path is the most important sequence of activities which has no float and which determines the project completion period
2. Critical path is the largest path with shortest duration withing which the project can be completed
3. The difference between early start time and late finish time must be equal to the activity duration

Which of the statements given above arc correct?

a. 1, 2 and 3

b. Only 1 and 2

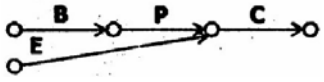
c. Only 1 and 3

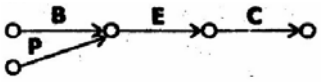
d. Only 2 and 3

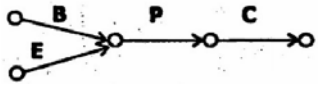
102. Consider the following tasks:

1. Placing of reinforcement (P) for roof slab cannot start before bending of reinforcement (B) and erection of flame work (E).
2. As soon as placing of reinforcement is finished, concreting (C) will follow.

The correct activity on arrow diagram representing for the above tasks is

a. 

b. 

c. 

d. 

103. Consider the following activities of a housing project

1. Flooring
2. Wall—plastering
3. Conceal wiring
4. Fixing doors—window frames
5. Fixing door—window shutters

What is the correct logical sequence of the above activities?

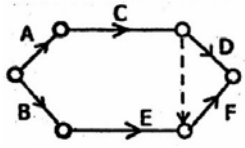
a. 4—3—2—5—1

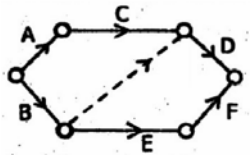
b. 3—1—5–4—2

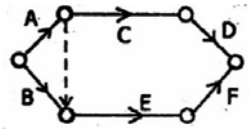
c. 1—4—5—2—3

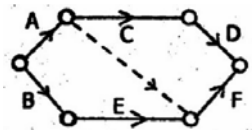
d. 1—2—3—4—5

104. Activities A and B can be started independently. Activity C follows activity A, and activity D follows activities B and C. Activity E follows activity B and precedes activity F. The activities D and F merge at the objective event. Which one of the following is the correct network of the project?

a. 

b. 

c. 

d. 

105. If ‘a’ is the optimistic–time, ‘b’ is the pessimistic time, and ‘m’ is most likely time of activity, then what is the expected time of activity ?

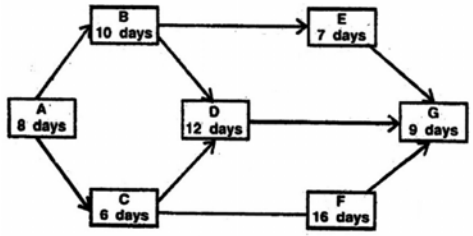
a. $\frac{a+m+b}{3}$

b. $\frac{a+2m+b}{5}$

c. $\frac{a+4m+b}{6}$

d. $\frac{a+3m+b}{6}$

106.



A small project, consists of seven activities in the activity—on—node diagram as shown in the figure above. The duration of these activities, in days and the predecessor relationships are shown. What is the total project duration of the project?

a. 39 days

b. 35 days

c. 34 days

d. 41 days

107. What is the process of incorporating changes and rescheduling or preplanning called?

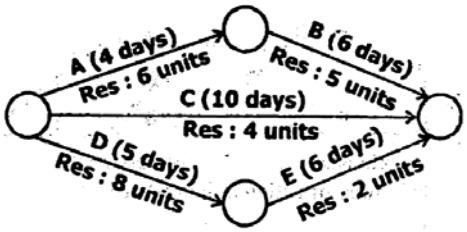
a. Resource allocation

b. Resource smoothing

c. Resource 1evelling

d. Updating

108.



The activity duration (days) and resource requirements (units) are shown in the figure above. What is the maximum resource required in a day?

a. 14 units

b. 11 units

c. 19 units

d. 18 units

109. A cantilever is to be attached to column. Which one among the following is the best connection.?

a. Framed connection

b. Seated' connection

c. Stiffened seated connection

d. End plate connection

110. Assertion (A) : The strength of brick masonry s purely dependent upon the type of mortar used.

Reason (R) : Mortar is the binding material in masonry.

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

111. Assertion (A) : Low heat Portland cement is used in dam construction.

Reason (R) : Low heat Portland cement attains higher 28 days' strength than ordinary Portland cements.

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) : Rebound hammer (Schmidt hammer) test gives only approximate estimation of strength of the concrete specimen.

Reason (R) : The test represents the hardness of the surface and provides no idea of the concrete inside.

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

113. Assertion (A) : In working stress method of design, the values of strain in cement concrete and steel at any point are same.

Reason (R) : There is a perfect bond between steel and surrounding cement concrete.

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

114. Assertion (A) : For a ductile material the maximum shear distortion theory is most suitable.

Reason (R) : The maximum shear distortion theory of failure assumes that yielding can occur in a general three—dimensional state of stress.

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

115. Assertion (A) : In limit state design, over-reinforced sections are not permitted.

Reason (R) : As the Concrete failure is brittle, the structure fails suddenly without any warning.

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

116. Assertion (A) : The working stress method of R.C.C. design of beams is also known as modular ratio method.

Reason (R) : The ratio of stress in steel and concrete is the same as that of elastic modulii of steel and concrete in beam.

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

117. Assertion (A) : For low discharges at high heads, reciprocating pumps are not suitable.

Reason (R) : In a reciprocating pump, the liquid is pushed out of the cylinder by actual displacement of a piston or a plunger.

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

118. Assertion (A) : Deflection of a beam with bolted connections is greater than that of a beam with riveted connections.

Reason (R) : Bolted connections allow greater slip between components than riveted connections.

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

119. Assertion (A) : Angle of inclination of lacing bars in a built- up column is constrained as $70^0 > \varphi > 40°$, where φ is angle of lacing with vertical.

Reason (R) : When this limit is not maintained, the total length of the bar will be large.

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

120. Assertion (A) : Smooth wheeled rollers are preferred for compacting granular soils but not cohesive soils.

Reason (R) : Cohesive soils tend to form a crust over the rolling smooth surface.

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