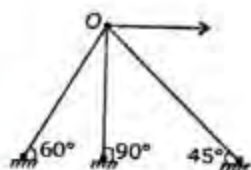


# CIVIL ENGINEERING

## (PAPER-I)



What is the most appropriate method for analysis of a skeletal plane frame shown in the figure above?

- Slope - deflection method
- Strain energy method
- Moment distribution method
- None of the above

2. A fixed beam AB of span  $l$  carries a uniformly distributed load  $w$ /unit length. During loading, the support B sinks downwards by an amount  $\delta$ . If  $\delta = \frac{wl^4}{72EI}$ , what is the fixing moment at B?

- $\frac{wl^2}{12}$
- $\frac{wl^2}{6}$
- $\frac{6EI\delta}{l^2}$
- Zero

3. What does the Williot - Mohr diagram yield?
- Forces in members of a truss
  - Moments in a fixed beam
  - Reactions at the supports
  - Joint displacement of a pinjointed plane frame

4. Two shafts, one of solid section and the other of hollow section, of same material and weight having same length are

subjected to equal torsional force. What is the torsional stiffness of hollow shaft?

- Equal to that of the solid shaft
- Less than that of the solid shaft
- More than that of the solid shaft
- Exactly half of that of the solid shaft



5.

What is the inclination of resultant reactions at A with the vertical for the frame shown in the above figure?

- $60^\circ$
- $40^\circ$
- $30^\circ$
- $50^\circ$

6.

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

### List-I (Load Case)

- Slope for tip load of  $W$
  - Deflection for tip load of  $W$
  - Slope for total UDL of  $W$
  - Deflection for total UDL of  $W$
- (Flexural rigidity =  $EI$ )

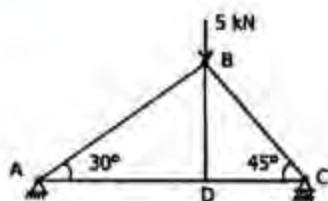
### List-II (Expression for Slope/Deflection)

- $WL^3 / 8EI$
- $WL^2 / 6EI$
- $WL^3 / 3EI$
- $WL^2 / 2EI$

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

d. 1 2 3 4

7.



What is the magnitude of the force in the member BD in the figure given above?

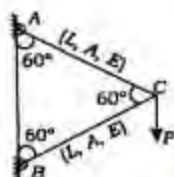
- 5 kN
- 7 kN(App)
- $4\sqrt{2}$  kN
- Zero

8.

A cantilever beam of T cross -section carries uniformly distributed load. Where does the maximum magnitude of the bending stress occur ?

- At the top of cross - section
- At the junction of flange and web
- At the mid- depth point
- At the bottom of the section

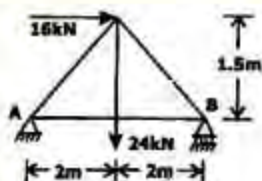
9.



What is the vertical deflection of joint C of the frame shown above?

- $PL/AE$
- $2PL/AE$
- $PL/2AE$
- $3PL/AE$

10.



What are the magnitudes of horizontal and vertical support reactions, respectively at support A of the frame shown above ?

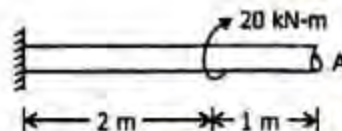
- 16 kN, 18 kN

- 16 kN, 6 kN

- 6 kN, 16 kN

- 8 kN, 6 kN

11.



A circular shaft of diameter 30 mm having shear modulus  $G = 80$  GPa is subjected to moment as shown above.

What is the maximum shear stress developed at periphery of shaft at A?

- 20.6 MPa
- 15.3 MPa
- 7.4 MPa
- Zero

12.

A close - coiled helical spring with  $n$  coils, mean radius  $R$  and diameter  $d$  is subjected to an axial load  $W$ . What is the compression in the spring?

- $\frac{64WR^3n}{Cd^3}$
- $\frac{64WR^3n}{Cd^4}$
- $\frac{32WR^3n}{Cd^3}$
- $\frac{32WR^3n}{Cd^4}$

13.

Consider the following statements:

- In a beam, the maximum shear stress occurs at the neutral axis of the beam cross - section.
- The maximum shear stress in a beam of circular cross - section is 50% more than the average shear stress.
- The maximum shear stress in a beam of triangular cross-section, with its vertex upwards occurs at  $b/6$  above the neutral axis.

Which of the statements given above are correct ?

- 1, 2 and 3
- 2 and 3 only
- 1 and 2 only



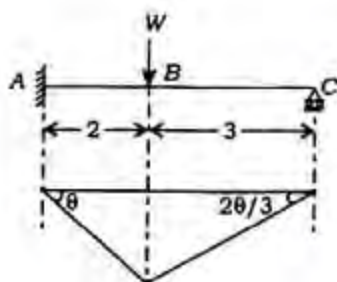
14. Length of plastic hinge of a beam depends on which of the following?

1. Span of the beam
2. Type of loading
3. Shape of cross - section
4. Yield strength of steel

Select the correct answer using the code given below

- a. 1, 2, 3 and 4
- b. 1, 2 and 3 only
- c. 2 and 3 only
- d. 1 and 4 only

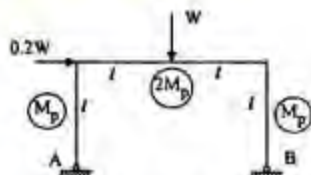
15.



If a uniform beam shown in the figure above has the plastic moment capacity  $M_p$  for span AB and  $0.9 M_p$  for span BC, what is the correct virtual work equation?

- a.  $M_p \theta + M_p \left( \theta + \frac{2\theta}{3} \right) = W \cdot 2\theta$
- b.  $M_p \theta + M_p \theta + 0.9 M_p \frac{2\theta}{3} = W \cdot 2\theta$
- c.  $M_p \theta + 0.9 M_p \left( \theta + \frac{2\theta}{3} \right) = W \cdot 2\theta$
- d.  $M_p \theta + 0.9 M_p \left( \theta + \frac{2\theta}{3} + \frac{2\theta}{3} \right) = W \cdot 2\theta$

16.



Collapse moment for the frame shown above has been worked out as  $M_p = Wl/5$ .

What is the horizontal reaction at A at collapse conditions

- a. 0
- b.  $0.1 W$
- c.  $0.2 W$
- d.  $0.4 W$

17. Consider the following statements in respect of gantry girders:

1. Gantry girders are designed for 23% extra load of crane capacity for impact.
2. Maximum deflection for dead and imposed loads without impact is limited to span / 500

Which of the statements given above is/are correct ?

- a. 1 only
- b. 2 only
- c. Both 1 and 2
- d. Neither 1 nor 2

18. Diagonal member of a roof truss of length  $l$  has been designed with tube of 100 mm mean diameter and 3 mm thick. The force in the member is tensile due to dead and live loads, and compressive due to occasional winds. What is the maximum permissible effective length of the member?

- a. 63m
- b. 875m
- c. 1225m
- d. 140m

19. At what value (nearly) is the maximum spacing of purlins for standard asbestos roofing sheets kept ?

- a. 1.0 m
- b. 1.4 m
- c. 1.8 m
- d. 2.0 m

20. Horizontal stiffeners are needed in plate girders if the thickness of web is

- a.  $< 6 \text{ mm}$
- b.  $< d/200$
- c.  $< L / 500$
- d. nearly equal to flange thickness

where  $d$  distance between the flanges and  $L$  = span

21. Consider the following statements pertaining to intermediate stiffeners
1. Stiffeners are provided to exclusively bear concentrated loads.
  2. Stiffeners should bear tightly against top and bottom flanges.
  3. Maximum spacing of stiffeners is restricted  $180t$ , where  $t$  is the thickness of web.

Which of the statements given above is/are correct?

- 1, 2 and 3
  - 1 and 2 only
  - 3 only
  - 2 only
22. A symmetrical plate girder has been fabricated with three equal plates. If a circular hole of diameter equal to half of its height is centrally cut in the web, what is the approximate ratio of the strength of this punctured girder to that of the original girder?
- 93%
  - 85%
  - 75%
  - 56%
23. For a pair of identical steel channel sections, tack - welded as a tension element, what is the net area of cross - section for design purposes ?
- Net area of the webs only
  - Net area of the flanges only
  - Net area of the webs and flanges
  - Web area plus a portion of the area of the flanges
24. The portal bracing is designed for which of the following?
- Wind forces only
  - Wind force +  $1\frac{1}{4}$  % of the compression force in two end posts
  - Wind force + 25% of the compression force in two end posts

d. Lateral shear + 25% of the compression force in two end posts

25. Why are intermediate vertical stiffeners provided in plate girders?
- To eliminate web buckling
  - To eliminate local buckling
  - To transfer concentrated loads
  - To prevent excessive deflection

26.



Four bolts share the load  $P$  as shown in the figure above. The shear strength of bolt is 30 kN and tension strength of bolt is 40 kN.

Which one of the following is the value of  $P$ ?

- 96 kN
  - 105 kN
  - 117 kN
  - 134 kN
27. What is the ratio of the permissible bearing stress in power -driven shop rivets relative to the yield stress of mild steel?
- 1.0
  - 0.8
  - 0.6
  - 0.4
28. A reduction in the allowable stress in steel chimney construction is necessary if the temperature exceeds
- $75^{\circ}\text{C}$
  - $100^{\circ}\text{C}$
  - $200^{\circ}\text{C}$
  - $300^{\circ}\text{C}$
29. A compound column had been fabricated with 4 angles of ISA  $50 \times 50 \times 6$  placed at corners of a square  $300 \text{ mm} \times 300 \text{ mm}$ . The radius of gyration of the angle is 10 mm. For the fabricated column, the overall slenderness ratio is 40. What is the



maximum distance between lacing bar attachments at the fabricated columns ?

- a. 500 mm
- b. 400 mm
- c. 300mm
- d. 280 mm

30. In the case of a continuous RC beam, in order to obtain the maximum positive span moment, where should the live load be placed?

- a. On all the spans
- b. On alternate spans starting from the left
- c. On spans adjacent to the spans under consideration
- d. On the span plus alternate spans

31. What is the allowable upward deflection in a prestress concrete member under serviceability limit state condition ?

- a. Span/250
- b. Span/300
- c. Span/350
- d. Span/500

32. Which one of the following predicts the effective modulus of elasticity of concrete.

- a.  $\frac{E_c}{1+\theta}$
- b.  $\frac{E_c}{1+2\theta}$
- c.  $\frac{E_c}{1+3\theta}$
- d.  $\frac{E_c}{1+5\theta}$

where  $E_c$  is short-term elastic modulus and  $\theta$  is the ultimate creep coefficient

33. What is the limiting principle tensile stress in prestress uncracked concrete member of M25 grade?

- a. 1 MPa
- b. 1.5 MPa
- c. 2 MPa
- d. 2.5 MPa

34. What is the minimum nominal percentage longitudinal reinforcement to be provided

in a concrete pedestal as per relevant IS code ?

- a. 0.4
- b. 0.2
- c. 0.15
- d. 0.1

35. Which one of the following is the correct expression to estimate the development length of deformed reinforcing bar as per IS code in limit state design?

- a.  $\frac{\Phi \sigma_s}{4.5 \tau_{bd}}$
- b.  $\frac{\Phi \sigma_s}{5 \tau_{bd}}$
- c.  $\frac{\Phi \sigma_s}{6.4 \tau_{bd}}$
- d.  $\frac{\Phi \sigma_s}{8 \tau_{bd}}$

where  $\Phi$  is diameter of reinforcing bar,  $\sigma_s$  is the stress in the bar at a section and  $\tau_{bd}$  is bond stress

36. The cover of longitudinal reinforcing bar in a beam subjected to sea spray should not be less than which one of the following?

- a. 30 mm
- b. 70 mm
- c. 75 mm
- d. 80 mm

37. Which one of the following is correct in respect of the material efficiency of RCC flexural elements in rectangular beam, T-beam and two-way slab?

- a. All the three sections are equally efficient
- b. T-beam section is most uneconomical
- c. Two-way slab is most economical
- d. The efficiency of rectangular section lies between that of T-beam and two-way slab sections

38. Which one of the following is correct working stress method of design for reinforced concrete is

- a. not a limit state design

- b. a serviceability limit state design  
c. a Limit state for crack width  
d. a collapse limit state
39. At the time of initial tensioning, the maximum tensile stress immediately behind the anchorage should not exceed which one of the following?
- $0.50 \times$  ultimate tensile stress
  - $0.60 \times$  ultimate tensile stress
  - $0.70 \times$  ultimate tensile stress
  - $0.80 \times$  ultimate tensile stress
40. Which one of the following is correct for horizontal spacing between the group of prestressing cables as per IS code ?
- Greater of, 40 mm and 5 mm plus maximum size of coarse aggregate
  - Greater of 40 mm and -5 mm plus maximum size of coarse aggregate
  - 50mm
  - 25mm
41. High strength steel used in prestressed concrete can take how much maximum strain?
- 2%
  - 3 %
  - 4%
  - 6%
42. In pretensional beams, which of the following losses is/are not considered ?
- Anchor loss
  - Shrinkage
  - Creep
  - Relaxation
  - Friction
  - Elastic shortening
- Select the correct answer using the code given below
- 1, 2 and 3 only
  - 4, 5 and 6 only
  - 5 only
  - 6 only
43. Prestressing force in a wire under thermal stressing can be estimated from which of the following?
- Pressure gauge with jack
  - Elongation of wire
  - Temperature rise
- Select the correct answer using the code given below
- 1 and 2 only
  - 1 and 3 only
  - 2 and 3 only
  - 2 only
44. Consider the following statements  
Modulus of elasticity of concrete is
- tangent modulus
  - secant modulus
  - proportional to  $\sqrt{f_{ck}}$
  - proportional to  $1/\sqrt{f_{ck}}$
- Which of the statements given above are correct?
- 1 and 3 only
  - 1 and 4 only
  - 2 and 3 only
  - 2 and 4 only
45. Which one of the following is employed to determine strength of hardened existing concrete structure ?
- Bullet test
  - Kelly ball test
  - Rebound hammer test
  - Cone penetrometer
46. Which one of the following is the correct expression for the target mean strength  $f_t$  of concrete mix ?
- $f_t = k f_{ck} + S$
  - $f_t = f_{ck} + K S$
  - $f_t = f_{ck} + S$
  - $f_t = k f'_{ck} + S$
- Where  $f_{ck}$  is characteristic strength, K is probability factor and S is standard deviation



47. What is the correct sequence of the following metals in the decreasing order of their Poisson's ratio ?

1. Aluminium
2. Cast iron
3. Steel

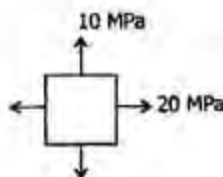
Select the correct answer using the code given below

- a. 1-2-3
- b. 2-1-3
- c. 1-3-2
- d. 3-1-2

48. A steel rod, 100 mm long is held between two rigid supports. It is heated by  $20^\circ\text{C}$ . If the coefficient of thermal expansion of the material of the rod is  $15 \times 10^{-6}/^\circ\text{C}$  and modulus of elasticity is  $200 \times 10^3 \text{ MN/m}^2$ , what is the stress in the rod?

- a.  $20 \text{ MN/m}^2$
- b.  $40 \text{ MN/m}^2$
- c.  $60 \text{ MN/m}^2$
- d.  $80 \text{ MN/m}^2$

49.



An element is subjected to stress as given above

For this state of stress, what is the maximum shear stress ?

- a. 2.5 MPa
- b. 5 MPa
- c. 10 MPa
- d. 15 MPa

50. If modulus of elasticity of a material is  $189.8 \text{ GN/m}^2$  and its Poisson's ratio is 0.30, what is the approximate value of shear modulus of the material?

- a.  $73 \text{ GN/m}^2$
- b.  $93.3 \text{ GN/m}^2$
- c.  $103.9 \text{ GN/m}^2$
- d.  $123.3 \text{ GN/m}^2$

51. A 20 cm long rod of uniform rectangular section, 8 mm wide  $\times$  1.2 mm thick is bent into the form of a circular arc resulting in a central displacement of 0.8 cm. Neglecting second - order quantities in computations, what is the longitudinal surface strain (approximate) in the rod?

- a.  $7.2 \times 10^{-4}$
- b.  $8.4 \times 10^{-4}$
- c.  $9.6 \times 10^{-4}$
- d.  $10.8 \times 10^{-4}$

52. Mohr's stress circle helps in determining which of the following ?

1. Normal stresses on one plane
2. Normal and tangential stresses on two planes
3. Principal stresses in all Three directions
4. Inclination of principal planes

Select the correct answer using the code given below

- a. 1 and 2 only
- b. 2 and 3 only
- c. 3 and 4 only
- d. 2 and 4 only

53. Consider the following statements:

Mohr's strain circle can be drawn

1. for plane stress conditions
2. if strains in three directions are known
3. if strains on two mutually perpendicular planes are known

Which of the statements given above are correct?

- a. 1, 2 and 3
- b. 2 and 3 only
- c. 1 and 2 only
- d. 1 and 3 only

54. What is the angle between principal strain axis and maximum shear strain axis?

- a.  $0^\circ$
- b.  $30^\circ$
- c.  $45^\circ$
- d.  $90^\circ$

55. In a strained material, the principal stresses in the  $x$  and  $y$  directions are  $100 \text{ N/mm}^2$  (tensile) and  $60 \text{ N/mm}^2$  (compressive). On an inclined plane, the normal to which makes an angle  $30^\circ$  to the  $x$ -axis, what is the tangential stress in  $\text{N/mm}^2$ ?

a.  $30\sqrt{3}$   
 b.  $40\sqrt{3}$   
 c. 60  
 d. 40

56. For a masonry dam of base width  $b$ , at which location w.r.t. the central line, should the resultant loading intersect the sections, to avoid tension in any horizontal section?

a. Outside of  $b/6$   
 b. Within  $b/6$   
 c. Within  $b/8$   
 d. At the central line

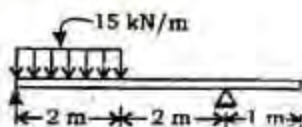
57. According to maximum shear stress criterion, at what ratio of maximum shear stress to yield stress of material, does the yielding of material take place?

a. 2  
 b.  $2\sqrt{3}$   
 c.  $1/\sqrt{3}$   
 d.  $1/2$

58. At what value of the ultimate shear strength, shall the material under the action of uniform axial tension fail due to shear?

a.  $< 0.5$  times the ultimate tensile strength  
 b.  $< 0.7$  times the ultimate tensile strength  
 c. = ultimate tensile strength  
 d.  $>$  the ultimate tensile strength

59.

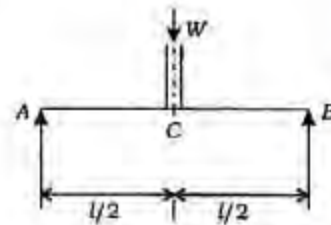


At what distance from left support of the above beam, is the shear force zero?

a. 1 m  
 b. 1.25 m

c. 1.5 m  
 d. 2.5 m

60.



For the simply supported beam in the figure above, C is the centre of the span. C is also the point through which the resultant of the column load  $W$  passes. The column rests on the beam over a small length symmetrically on either side of C. What is the shearing force at C?

a.  $W/2$   
 b.  $W/4$   
 c.  $W$   
 d. 0

61. The depreciation charges for a machine are thirty paise per working hour. The machine has a scrap value of Rs 2,000 and a working hour average life of 24000 hours. What is the purchase price of the machine?

a. Rs 1,800  
 b. Rs 7,200  
 c. Rs 9,200  
 d. Rs 14,275

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

**List-I**

A. Agitator truck  
 B. Needle vibrator  
 C. Concrete pump  
 D. Tremie pipe

**List-II**

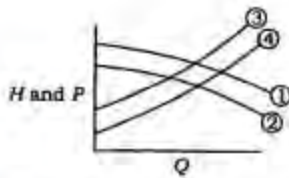
1. Placing of concrete  
 2. Underwater concreting  
 3. Compaction of concrete  
 4. Ready mixed concrete transport

A      B      C      D



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

63.



The performance of a centrifugal pump [H and P vs. Q] is typically shown in the figure with four curves numbered 1, 2, 3 and 4. which one of the following is correct?

- a. 1 and 2 refer to P, with P along 1 referring to greater speed than P along 2  
 b. 1 and 2 refer to H, with H along 1 referring to greater speed than H along 2  
 c. 3 and 4 refer to P, with P along 3 referring to lesser speed than P along 4  
 d. 3 and 4 refer to H, with H along 3 referring to greater speed than H along 4

64. Consider the following types of bridges

1. Arch bridge
2. Double cantilever bridge
3. Suspension bridge
4. Truss bridge

What is the correct sequence in the ascending order of the span ranges generally adopted for the bridges given above?

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

65. As the span of a bridge increases, how does the impact factor vary?

- a. It decreases  
 b. It increases  
 c. It remains constant  
 d. It increases up to a critical value of span and then decreases

66. The optimistic, most likely and pessimistic time estimates of an activity are 5, 10 and 21 days respectively. What are the expected time and standard deviation?

- a. 12, 3  
 b. 11, 4  
 c. 11, 267  
 d. 10, 16

67. What is the time by which the completion of an activity can be delayed without affecting the start of succeeding activities, called?

- a. Total float  
 b. Interfering float  
 c. Independent float  
 d. Free float

68. Duration along the critical path defines which of the following?

1. Shortest duration needed
2. Shortest duration permissible
3. Longest duration needed
4. Longest duration permissible

Select the correct answer using the code given below

- a. 1 and 2 only  
 b. 1 and 4 only  
 c. 2 and 3 only  
 d. 3 and 4 only.

69. Consider the following statements

1. Setting and hardening of cement takes place after the addition of water.
2. Water causes hydration and hydrolysis of the constituent compounds of cement which act as binders

Which of the statements given above is/are correct?

- a. 1 only  
 b. 2 only  
 c. Both 1 and 2  
 d. Neither 1 nor 2

70. Assertion (A) : Wooden window shutters should be fitted, leaving proper tolerances for dimensional changes.

Reason (R) : Timber sections change in volume with change in seasons.

- 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

71. Assertion (A) : Time - cost studies have to be firmed up before the EOQ and ABC analyses can be undertaken

Reason (R) : Time-cost studies can be premised on no bottlenecks or shortages in materials procurement.

- 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

72. Assertion (A) : Critical path can pass through dummy arrows also.

Reason (R) : Necessary additional nodes are introduced to ensure uniqueness of i-j notation for activities.

- 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

73. Assertion (A) Slenderness ratio of tension members is restricted to 250.

Reason (R) : Slenderness ratio for tension members is a stiffness criterion associated with self - weight.

- 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

74. Assertion (A) Even though vibration is the best technique of obtaining a durable and strong concrete, it cannot produce a

compact concrete, if the mix is not properly graded or designed.

Reason (R) : Over-vibrating of concrete with a slump of more than 10 cm may lead to honeycombing and a top surface which is not durable.

- 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

75. Which one of the following is the most preferred wood for high quality and durable furniture?

- a. Sandalwood
- b. Deodar wood
- c. Teakwood
- d. Shishani wood

76. As a natural material, timber is which one of the following?

- a. Isotropic
- b. Anisotropic
- c. Homogeneous
- d. Heterogeneous

77. Shear strength of timber depends on which one of the following ?

- a. Lignin with fibres
- b. Medullary rays
- c. Heartwood
- d. Sapwood

78. The defect which develops due to uncontrolled and non - uniform loss of moisture from wood is known as which one of the following?

- a. Knot
- b. Shake
- c. Warping
- d. Cross grain

79. For ornamental work, which type (s) of bricks is/are preferred?

- 1. Silica bricks
- 2. Silica lime bricks
- 3. Bricks produced in autoclaves



Select the correct answer using the code given below

- a. 1 and 3 only
- b. 2 and 3 only
- c. 1 only
- d. 2 only

80. Which one of the following is the nominal size of standard modular brick?

- a. 25 cm × 13 cm × 8 cm
- b. 25 cm × 10 cm × 8 cm
- c. 20 cm × 10 cm × 10 cm
- d. 20 cm × 15 cm × 10 cm

81. Why are bricks soaked in water before using in brick masonry?

- a. For removing dust
- b. For reducing air voids
- c. For preventing depletion of moisture from mortar
- d. For reducing efflorescence

82. Which type of brick masonry bond is provided for heavy loads on masonry?

- a. English bond
- b. Zigzag bond
- c. Single Flemish bond
- d. Double Flemish bond

83. Consider the following type of cements:

1. Portland pulverized fuel ash cement
2. High alumina cement
3. Ordinary Portland cement
4. Rapid hardening cement

Which one of the following is the correct sequence of the above cements in terms of their increasing rate of strength gain?

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

84. Ultimate strength of cement is influenced by which one of the following?

- a. Tricalcium silicate
- b. Dicalcium silicate
- c. Tricalcium aluminate

d. Tetracalcium aluminato - ferrite

85. Why is lime added to cement slurry for the topcoat of plastering?

- a. To improve the strength of plaster
- b. To stiffen the plaster
- c. To smoothen the plaster for ease of spread
- d. To make the plaster non - shrinkable

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

List-I

(Cement Mortar for Different Work)

- A. Cement mortar for normal brick work
- B. Cement mortar for plastering work
- C. Cement mortar for grouting the cavernous rocks
- D. Cement mortar for guniting

List - II (Cement : Sand in Mortar)

1. 1 : 4
2. 1 : 3
3. 1 : 6
4. 1 : 1.5

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

87. In what context is the slump test performed?

- a. Strength of concrete
- b. Workability of concrete
- c. Water-cement ratio
- d. Durability of concrete

88. Consider the following statements

The use of superplasticizers as admixture

1. increases compressive strength of concrete
2. permits lower water - cement ratio, thereby strength is increased
3. reduces the setting time of concrete

4. permits lower cement content, thereby strength is increased

Which of the statements given above is/are correct?

- a. 1 and 3 only
- b. 3 and 4 only
- c. 1, 3 and 4 only
- d. 2 only

89. Consider the following statements

Curing of concrete is necessary because

- 1. concrete needs more water for chemical reaction
- 2. it is necessary to protect the water initially mixed in concrete from being lost during evaporation
- 3. penetration of surrounding water increases the strength of concrete

Which of the statements given above is/are correct?

- a. 1, 2 and 3
- b. 1 and 3 only
- c. 2 only
- d. 3 only

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

**List-I**

- A. Absorption and surface moisture in aggregates
- B. Deleterious material
- C. Grading of aggregate
- D. Chemical stability

**List-II**

- 1. Interferes with hydration of cement
- 2. Improves workability of mix
- 3. Ensures durability of all types of structures
- 4. Affects the mix proportions

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

91. What is the maximum permissible longitudinal pitch in staggered riveted compression joints?

- a. 500 mm
- b. 400 mm
- c. 300mm
- d. 100mm

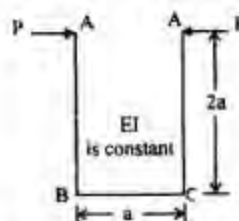
92. A concentrated load  $W$  moves on the span of a three- hinged arch. The horizontal thrust at the supports is maximum when the load is at which one of the following?

- a. The springing
- b. One-sixth of the span from one end
- c. Quarter span
- d. The crown

93. Which one of the following is the correct statement? In a gusseted base, when the end of the column is machined for complete bearing on the base plate, the axial load is assumed to be transferred to the base plate

- a. fully by direct bearing
- b. fully through the fastenings
- c. 50% by direct bearing and 50% through fastenings
- d. 75% by direct bearing and 25% through fastenings

- 94.



In the structure shown in the figure above, what is the distance through which the points A move towards each other?

- a.  $4 Pa^3 / EI$
- b.  $16 Pa^3 / 3EI$
- c.  $28 Pa^3 / 3EI$
- d.  $6 Pa^3 / EI$

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

**List - I (Shape of Structural Section)**



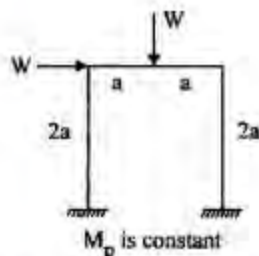
- A. Rectangular
- B. Circular
- C. I-section
- D. Diamond

### List - II (Shape Factor)

- 1. 2.0
- 2. 1.1 to 1.2
- 3. 1.5
- 4. 1.7

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

96.



What is the ultimate load for the frame shown in the figure above?

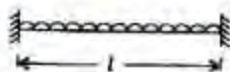
- a.  $M/a$
- b.  $2 M_p/a$
- c.  $3 M/a$
- d.  $4 M_p/a$

97.

What is the number of plastic hinges which will cause the overall total collapse of a structure?

- a. One more than the order of statical indeterminacy
- b. Equal to order of statical indeterminacy
- c. One less than the order of statical indeterminacy
- d. Not determinable

98.



The above figure shows a fix - ended beam of elastic material possessing sufficient

ductility and of uniform cross-section. It carries a uniformly distributed load which is gradually increased to its ultimate value  $W_u$ /unit length, at which the beam is transformed into a failure mechanism. What is the magnitude of  $W_u$  in terms of the ultimate moment  $M_u$  of the beam - section and span  $l$

- a.  $8 M_u / l^2$
- b.  $12 M_u / l^2$
- c.  $16 M_u / l^2$
- d.  $24 M_u / l^2$

99.

What is / are the use(s) of influence lines?

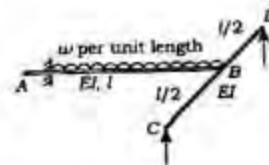
- a. To study the effect of moving loads on the structure
- b. To calculate the value of stress function with the critical load condition
- c. To find the position of live load for a maximum value of particular stress function
- d. Towards all the above purpose

100.

What is the variation of influence line for stress function in a statically determinate structure?

- a. Parabolic
- b. Bilinear
- c. Linear
- d. Uniformly rectangular

101.



Which one of the following is the reaction of the cantilever at B as shown in the figure above?

- a.  $3/8 w/l$
- b.  $5/8 w/l$
- c.  $6/17 w/l$
- d.  $3/21 w/l$

102.

The displacement method is also referred to as which one of the following?

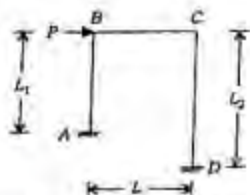
- a. Minimum strain energy method

- b. Maxwell-Mohr method
- c. Consistent deformation method
- d. Slope-deflection method

103. A beam carries a uniformly distributed load throughout its length. In which of the following configurations will the strain energy be maximum?

- a. Cantilever
- b. Simply supported beam
- c. Propped cantilever
- d. Fixed beam

104.



The shear equation for the portal frame shown in the above figure will be

- a.  $\left( \frac{M_{AB} + M_{BA}}{L_1} \right) + \left( \frac{M_{CD} + M_{DC}}{L_2} \right) + P = 0$
- b.  $\left( \frac{M_{AB} + M_{BA}}{L_1} \right) + \left( \frac{M_{BC} + M_{CB}}{L} \right) + P = 0$
- c.  $\left( \frac{M_{BC} + M_{CB}}{L} \right) + \left( \frac{M_{CD} + M_{DC}}{L_2} \right) + P = 0$
- d.  $\left( \frac{M_{AB} + M_{CD}}{L_1} \right) + \left( \frac{M_{BA} + M_{DC}}{L} \right) - P = 0$

105. Which one of the following statements is correct?

- a. In slope-deflection method, the forces are taken as unknowns
- b. In slope-deflection method, the joint rotations are taken as unknowns
- c. Slope-deflection method is not applicable for beams and frames having settlement at the supports
- d. Slope-deflection method is also known as force method

106.



What are the bending moments at the ends A and B of a uniform beam AB fixed in

direction and position at A and B when acted upon by two concentrated loads at 1/3rd span as shown in the figure above?

- a.  $2/9 WL$
- b.  $4/9 WL$
- c.  $6/9 WL$
- d.  $8/9 WL$

107. A tractor-trailer assembly has a gross weight of 25 tonnes. When moving over a level road, its rolling resistance is 42 kg per tonne. It is moved up a road of 5% grade. What is the required tractive effort ?

- a. 1050.5 kg
- b. 1060.5 kg
- c. 1085 kg
- d. 1102.5 kg

108. Which one of the following shovel excavators is considered most efficient in loading carriers ?

- a. Dipper shovel
- b. Dragline
- c. Backhoe
- d. Clamshell

109. Bottom-dump wagons are suitable for handling which of the following?

- a. Wet sticky clay
- b. Sand and gravel
- c. Quarry rocks
- d. Any type of material

110. Vibratory rollers are more useful for compacting which of the following?

- a. Sandy soils
- b. Silty soils
- c. Clayey soils
- d. Mixed soils

111. When power shovels are operated under different site conditions (in terms of material handled), what is the correct sequence in the increasing order of the output for the following materials?

1. Well - blasted rock
2. Hard and tough clay
3. Poorly blasted rock
4. Moist loam or sand

Select the correct answer using the code given below :



- a. 1-2-3-4  
b. 1-4-3-2  
c. 4-2-3-1  
d. 4-3-1-2
112. For three - dimensional movement of a weight, which one of the following is most suitable ?  
a. Chain hoist  
b. Winch  
c. Crane  
d. Jack

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

**List - I (Crane)**

- A. Tower crane  
B. Floating crane  
C. Mobile crane  
D. Gantry crane

**List - II (Suitable for)**

1. Hydraulic structures  
2. High industrial plant  
3. Longitudinal and lateral movements of load  
4. Railway electrification

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

114. How are concrete mixers specified?  
a. By the number of cement bags used in a batch  
b. By the nominal volume of concrete that can be mixed in a batch  
c. By the volume of water used  
d. By the volume of aggregate used
115. What is the minimum width of roadway for a six - lane high -level bridge constructed for the use of road traffic only?  
a. 215 m  
b. 225 m  
c. 240 m  
d. 255 m

116. What is the optimum mortar mix type for maximum masonry unit strength of  $15 \text{ N/mm}^2$

- a.  $M_1$   
b.  $M_2$   
c.  $H_1$   
d.  $H_2$

117. In load- bearing wall, the depth of horizontal chasis should not exceed which one of the following?

- a.  $1/3$  thickness of masonry  
b.  $1/4$  thickness of masonry  
c.  $1/5$  thickness of masonry  
d.  $1/6$  thickness of masonry

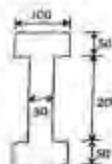
118. What is a tendon profile, in which the eccentricity is proportional to the bending moment caused by any loading on a rigidly supported indeterminate structure, at all cross - sections ?

- a. Cable profile  
b. Resultant profile  
c. Concordant profile  
d. Reduced profile

119. What is the distance between the kems for the section given below?

- a. 100 units  
b.  $> 100$  units,  $< 150$  units  
c.  $< 100$  units  
d.  $> 150$  units

120.



For a rectangular prestressed beam designed for operating stress conditions, what is the maximum prestressing force ?

- a.  $bd\sigma_c$   
b.  $\frac{1}{2} \times (bd\sigma_c)$   
c.  $\frac{1}{3} \times (bd\sigma_c)$   
d.  $\frac{1}{6} \times (bd\sigma_c)$