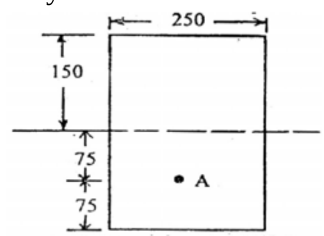
CIVIL ENGINEERING

(PAPER – I)

1. In an axially loaded spirally reinforced short column, the concrete inside the core is subjected to
   a. bending and compression
   b. biaxial compression
   c. triaxial compression
   d. uniaxial compression
2. The maximum permissible shear stress $\tau_{c\ max}$ given in BIS 456-1978 is based on
   a. diagonal tension failure
   b. diagonal compression failure
   c. flexural tension failure
   d. flexural compression failure
3. If the loading on a simply supported pre-stressed concrete beam is uniformly distributed, the centroid of tendons should be preferably
   a. a straight profile along the centroidal axis
   b. a straight profile along with the lower kem
   c. a parabolic profile with convexity downward
   d. a circular profile with convexity upward
4. In the design of a masonry retaining wall, the
   a. vertical load should fall within the middle-third of base width
   b. horizontal thrust should act as h/3 from base
   c. resultant load should fall within a distance of one-sixth of base width on either side of its midpoint
   d. resultant load should fall within a distance of one-eighth of base width on either side of its midpoint
5. In the prestressed concrete beam section shown in the given figure (all dimensions in mm is the figure), if the net losses are 15% and final prestressing force applied at 'A' is 500 kN, the initial extreme fibre stresses at top and bottom will be respectively



   a. -3.40 N/mm^2 and 16.70 N/mm^2
   b. -3.40 N/mm^2 and 19.60 N/mm^2
   c. -4.0 N/mm^2 and 16.70 N/mm^2
   d. -4.0 N/mm^2 and 19.60 N/mm^2
6. Consider the following statements :
   The design for the limit state of collapse in flexure is based on the following assumptions :
   1. Plane sections normal to the axis remain
   2. the maximum strain in concrete at the outermost tension fibre is 0.0035
   3. The relationship between the compressive stress distribution is concrete and the strain in concrete may be assumed to the rectangular, trapezoidal, parabolic or any other shape which results in prediction of strength in substantial agreement with the results of tests

   Select the correct answer using the codes given below :
   a. 1 and 3
   b. 1, 2 and 3
   c. 2 and 3
   d. 1 and 2
7. In case of deep beam or in thin webbed R.C.C. members, the first crack form is
   a. flexural crack
   b. diagonal crack due to compression
   c. diagonal crack due to tension
   d. shear crack
8. The stress block in concrete for an estimate of ultimate strength in flexure of a prestressed beam

a. should be parabolic
b. should be parabolic-rectangular
c. should be rectangular
d. may be of any shape which provides agreement with the test data

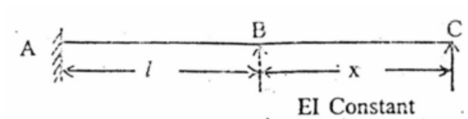
9. The chances of diagonal tension cracks in R.C.C. member reduce when
a. axial compression and shear force act simultaneously
b. axial tension and shear force act simultaneously
c. only shear force act
d. flexural and shear force act simultaneously

10. The probability of failure implied in limit state design is of the order of
a. 10^{-2}
b. 10^{-3}
c. 10^{-4}
d. 10^{-5}

11. Cross sectional area of metal core in composite column should not be more than
a. 4%
b. 8%
c. 16%
d. 20%

12. Assertion (A) : For equal distribution of moment at the support 'B' of the beam shown in the given figure the span length x required = 3/4 *l*.

Reason (R) : For equal distribution of moment for the beam shown in the figure at 'B', I/*l* = 3*l*/4x.



a. Both A and R are true and R is the correct explanation of A
b. Both A and R are 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

13. Assertion (A) : Calcium chloride addition in concrete proves more effective in slow-hardening portland cement than in rapid-hardening cement.

Reason (R) : Calcium chloride acts as an effective accelerator thereby increasing rate of reaction.

a. Both A and R are true and R is the correct explanation of A
b. Both A and R are 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

14. Assertion (A) : In the hydraulically-controlled bulldozers, the blade can be force into the ground more accurately than in the cable-controlled bulldozers.

Reason (R) : High friction on the blade is produced in addition to its with in the hydraulically-controlled bulldozers.

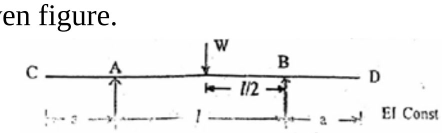
a. Both A and R are true and R is the correct explanation of A
b. Both A and R are true but R is NOT the correct explanation of A
c. A is true but R is false
d. A is false but R is true

15. Assertion (A) : Te failure surface of a mild steel torsion specimen subjected to a torque about its axis along a surface perpendicular to its axis.

Reason (R) : Mild steel is relatively weaker in shear than in tension and the plane of maximum shear is perpendicular to its axis.

a. Both A and R are true and R is the correct explanation of A
b. Both A and R are 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

16. Consider the loaded beam shown in the given figure.



Assertion (A) : The deflection at the free end 'C' is 'a' times the slope at A.

Reason (R) : The elastic curve for the overhang portion AC or BD is a straight line tangential to the elastic curve at A and B.

a. Both A and R are true and R is the correct explanation of A
b. Both A and R are 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

17. Assertion (A) : In a pin-jointed plane frame consisting of straight members the total strain energy 'U' of the system may be expressed as

$$U = \sum \frac{S^2 L}{2AE}$$

Where S is the axial force, A the uniform cross-sectional area and L the length of the individual member. E is the modulus of elasticity of the member material.

Reason (R) : In pin-jointed plane frames only axial forces are present.

a. Both A and R are true and R is the correct explanation of A
b. Both A and R are 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

18. Assertion (A) : In a cantilever, the I.L. diagram for deflection at the free end is same as elastic curve of the beam due to unit load placed at the free end.

Reason (R) : By Maxwell's Reciprocal theorem, the deflection at the free end, due to various positions of unit load on the span, equals deflection at those placed of unit moving load due to static unit load at the free end.

a. Both A and R are true and R is the correct explanation of A
b. Both A and R are 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

19. Assertion (A) : Impact factor is used in the design of a gantry girder.

Reason (R) : Loads transferred to the gantry girder are momentary.

a. Both A and R are true and R is the correct explanation of A
b. Both A and R are 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

20. Assertion (A) : According to BIS 456-1978, over-reinforced sections are not permitted.

Reason (R) : There is ductile failure of over-reinforced sections.

a. Both A and R are true and R is the correct explanation of A
b. Both A and R are 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

21. Assertion (A) : Over-reinforced design of reinforced concrete sections is undesirable.

Reason (R) : Tension failure of reinforced concrete sections is sudden.

a. Both A and R are true and R is the correct explanation of A
b. Both A and R are 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

22. On application of external stress on timbers, it behaves like

a. an elastic material
b. non-elastic material
c. viscoelastic material
d. non-viscoelastic material

23. The ratio of tangential shrinkage to radial shrinkage of wood due to reduction in moisture content is

a. in the range from 3.1 to 5.1
b. in the range from 2 to 3
c. in the range from 1 to 2
d. less than or equal to 1

24. Which one of the following procedure is applied to determine the soundness of bricks ?

a. Immersing the brick under water for 16 hrs and determining the quantity of water absorbed by the brick
b. immersing the brick under water of 24 hrs and determining its expansion using Le Chatelier apparatus
c. taking two bricks, hitting one against the other and observing whether they break or not and the type of sound produced while hitting
d. scratching the brick by finger nail and noting whether any impression is made or not

25. The number of bricks required per cubic metre of brick masonry is

a. 400
b. 450

c. 500

d. 550

26. The bricks which are extensively used for basic refractories in furnaces are

a. Chrome bricks

b. Sillimanite bricks

c. Magnesite bricks

d. Fosterite bricks

27. Consider the following statements :

High Alumina cement (HAC)

1. has high early compressive strength and high heat of hydration than OPC-43 grade.

2. is not suitable to be used in cold regions

Which of these statements is/are correct ?

a. 1 alone

b. 2 alone

c. both 1 and 2

d. neither 1 and 2

28. Consider the following statements :

when cement is tested for setting time; on gauging its shows quick setting. This phenomenon known as "Flash set" of cement is due to the presence of high

1. Tricalcium Aluminate (C_3A) in cement

2. Alkalies in cement

3. Tricalcium Silicate (C3S) in cement

Which of these statements are correct ?

a. 1, 2 and 3

b. 2 and 3

c. 1 and 2

d. 1 and 3

29. Which one of the following statements regarding the cement fineness is NOT correct ?

a. Fine cement is more liable to suffer from shrinkage cracking than a coarse cement

b. Fine cement will show faster rate of hardening than coarse cement

c. Fine cement shows faster rate of heat evolution and total quantity of heat evolve is much larger than coarse cement

d. Fine cement shows the same setting time as coarse cement

30. For marine works, the best suited cement is

a. low heat portland cement

b. rapid hardening cement

c. ordinary portland cement

d. blast furnace slage cement

31. The maximum bulking of sand is likely to occur at a moisture content of

a. 5%

b. 8%

c. 11%

d. 14%

32. One of the main demerits in using the lime mortar is that it

a. is not durable

b. does not set quickly

c. swells

d. is plastic

33. Which one of the following types of concrete is most suitable in extreme cold climates ?

a. Air-entrained

b. Ready mix concrete

c. Vacuum concrete

d. Coarse concrete

34. Match List I(Workability test) with List II (Measurements) and select the correct answer :

List I

A. Slump test

B. Compacting factor

C. Vebe test

D. Flow test

List II

1. 300 mm to 500 mm

2. 75 mm to 125 mm

3. 0.80 to 0.98

4. zero to 10 s

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

35. Consider the following statements :

Curing of concrete by steam under pressure

1. increases the compressive strength of concrete

2. reduces the shear strength of concrete

3. increases the speed of chemical reaction.

Select the correct answer using the codes given below :

a. 1, 2 and 3
b. 1 alone
c. 2 and 3
d. 3 alone

36. Which one of the following aggregates given maximum strength in concrete ?

a. Rounded aggregate
b. Elongated aggregate
c. Flaky aggregate
d. Cubical aggregate

37. Consider the following statements :

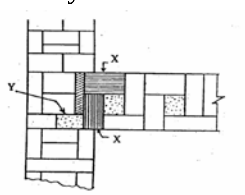
Ultrasonic pulse velocity test to measure the strength of concrete is

1. used to measure the strength of wet concrete
2. used to obtain estimate of concrete strength of finished concrete elements
3. a non-destructive test

Of these statements

a. 1, 2 and 3 are correct
b. 2 and 3 are correct
c. 1 and 2 are correct
d. 1 and 3 are correct

38. The given figure shows the Tee junction in brick masonry which is known as



a. English bond
b. English cross bond
c. Flemish bond
d. Double Flemish bond

39. Guniting is the application of mortor

a. on a surface under pneumatic pressure
b. on a vertical surface
c. on brickwork by manual method
d. of fluid consistency for repair works

40. In building construction, the place for providing dampproof course is at the

a. basement level
b. window sill level
c. lintel level
d. roof level

41. A construction concrete mixer of capacity 0.8 m^3 is used and the mixer discharges the entire batch of concrete into a single hopper. The time per cycle may be taken for changing, mixing and discharging mixes as 1.6 minutes and lost time may be taken as 0.15 minutes. The number of batches per hour is equal to

a. $\dfrac{60}{1.6+0.15}$
b. $\left(\dfrac{60}{1.6}\right)-0.15$
c. $\left[\dfrac{60-0.15}{1.6}\right]\times 0.8$
d. $\dfrac{60}{1.6-0.15}$

42. Which of the following statements are the advantages of surface vibrators?

Surface vibrators are best suited

1. for one way reinforced slabs and road surfaces
2. when depth of the concrete to be vibrated exceeds 250 mm.
3. where immersion vibrations are impracticable.

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

43. The output Q of the earth moving equipment like excavators, shovels, loaders (where q is production per cycle in m^3 and c is cycle time in seconds) is

a. $\dfrac{q\times 3600\times \text{efficiency}}{c}\, m^3/hr$
b. $q \times 3600 \times$ efficiency m^3/hr
c. $qc \times 3600 \times$ efficiency m^3/hr
d. $q \times 3600$ m^3/hr

44. For a given load rating, the operating radius of crane can be increased by

a. increasing weight of the machine
b. increasing engine horse power
c. increasing the length of boom or arm
d. operating the crane slowly

45. Concreting at site can start on any one day, with all preparations having been done on

the previous day. As per the past experience of owner, contractor and the architect, it is decided that the chance of any one being late is 0.4. The chance of starting on time on the appointed day is

a. 0.064

b. 0.216

c. 0.288

d. 0.432

46. In PERT analysis, the time estimates of activities and probability of their occurrence follow

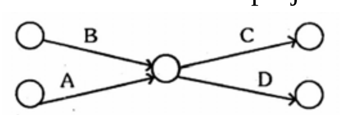
a. Normal distribution curve

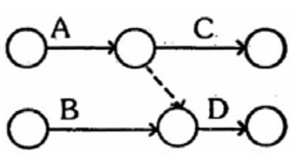
b. β–distribution curve

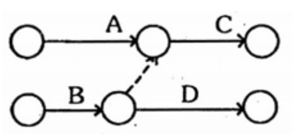
c. Poisson's distribution curve

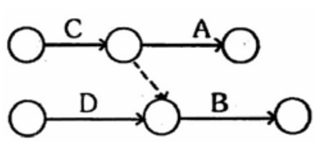
d. Binomial distribution curve

47. Activity 'C' follows activity 'A' and activity 'D' follows activities 'A' and 'B'. The correct network for the projects is

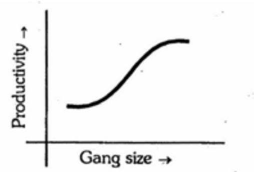
a. 

b. 

c. 

d. 

48. Consider the following statements regarding the curve shown in the given figure :



As the gang size increases,

1. the out-tum rate of the gang will always increase irrespective of the number of gang

2. The out-tum rate of the gang will decrease once it exceeds the optimal number

3. beyond the optimal number, the inefficiency of the gang will increase.

Which of these statements are correct ?

a. 1, 2 and 3

b. 1 and 2

c. 2 and 3

d. 1 and 3

49. In the time-cost analysis, the cost slope is defined as

a. $\dfrac{\text{Crash cost} - \text{Normal cost}}{\text{Crash time} - \text{Normal time}}$

b. $\dfrac{\text{Crash time} - \text{Normal time}}{\text{Crash cost} - \text{Normal cost}}$

c. $\dfrac{\text{Crash cost} - \text{Normal cost}}{\text{Normal time} - \text{Crash time}}$

d. $\dfrac{\text{Normal cost} - \text{Crash cost}}{\text{Normal time} - \text{Crash time}}$

50. Which one of the following is the base for resource levelling?

a. Delaying the completion of critical activities

b. Delaying the start of non-critical activities

c. Reducing completion time of critical activities

d. Not delaying the completion of critical activities

51. A construction equipment has a useful life of 5 years after which it is to be replaced by a new one. If the interest rate is 4%, the sinking fund factor will be

a. 0.033

b. 0.184

c. 0.224

d. 0.232

52. Pay-back period gives an estimate of

a. profitability

b. liquidity

c. time-value of money

d. interest rate of return

53. For supplying water to a city, two alternate design concepts are beings considered with 8% p.a. discrete compounding as the criterion. A rock tunnel of indefinitely long life will cost Rs. 30 lakhs now, and

will need Rs. 60,000 per year for operations. The alternative is by a pipe line system, with an expected life of 20 years, at a first cost of Rs. 20 lakhs now, and will need annual operating expenses of Rs. 92,000. In term of annualized costs, the tunnel system will have a relative advantage of (give C.R.F. at 8% p.a. discrete compounding for 20 years = 0.10185) nearly

a. Rs. 14,000

b. Rs. 11,000

c. Rs. 8,200

d. Rs. 4,300

54. Payment allowance is selected keeping in mind

a. overall cost

b. normal profit and total time

c. overall cost and total time

d. overall cost, normal profit and total time

55. A unique relation between bending movement (M) and intensity of load(w) acting continuously on a beam of span (L) at a distance(x) along the axis (The flexural rigidity of beam is El) is given by

a. $M = \frac{wL^2}{8}$

b. $w = \frac{d^2M}{dx^2}$

c. $M = El\frac{d^2M}{dx^2}$

d. $M = \frac{wL^2}{12}$

56. Which of the following points are considered while deriving the formula

$$\frac{M}{I} = \frac{f}{y} = \frac{E}{R} \text{ ?}$$

1. Type of material

2. Transverse shear force

3. The stresses in the remaining principal direction

4. $\sigma_y = \sigma_z = \tau_{xz} = \tau_{zx} = 0$

5. Linear variation of strain.

Select the correct answer using the codes given below :

a. 1, 2 and 4

b. 2, 3 and 5

c. 4 and 5

d. 1 and 3

57. Out of the two beams of same material and same cross-sectional area one is of circular cross-section and other is of square cross-section. If these are subjected to bending moment of same magnitude, then

a. both sections would be equally strong

b. both sections would be equally economical

c. square section would be more economical than circular section

d. square section would be less economical than circular section

58. A beam has a triangular cross-section having base 40 mm and altitude 60 mm. If this section is subjected to a shear force of 36000 N, the maximum shear stress in the cross-section would be

a. 60 N/mm^2

b. 36 N/mm^2

c. 45 N/mm^2

d. 30 N/mm^2

59. Consider the following statements :

The shear stress over a beam section of any shape for a given loading does not vary with

1. shear force at the section

2. area of the section

3. moment of inertial of the section

Which of these statements are correct ?

a. 1 and 2

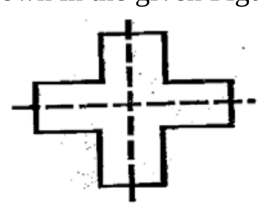
b. 1 and 3

c. 2 and 3

d. 1, 2 and 3

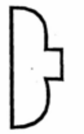
60. Which one of the following shear stress distribution diagrams is correct for cross-bar section shown in the given Figure-I ?

Figure I



a. 

b. 

c. 

d. 

61. A rectangular beam of width 100 mm is subjected to a maximum shear force of 60 kN. The corresponding maximum shear stress in the cross-section is 4 N/mm^2. The depth of the beam should be

a. 150 mm
b. 225 mm
c. 200 mm
d. 100 mm

62. Consider the following statements :

When a beam of square cross-section is used with a diagonal in a vertical position,

1. the shear stress, distribution across the section of the beam will be zero both at top and bottom
2. the shear stress distribution across the section of the beam will be zero both at top and bottom.
3. the maximum stress does not occur at neutral axis.

Which of these statements are correct ?

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

63. A simply supported beam 'A' carries a point load at its midspan. Another identical beam 'B' carries the same magnitude of load but it is uniformly distributed over the entire span. The ratio of the maximum deflections of beams 'A' and 'B' will be

a. 8/3
b. 2/3
c. 3/5
d. 8/5

64. The maximum deflection of simply supported beam occurs at zero

a. bending moment location
b. shear force location
c. slope location
d. shear force location and also zero bending moment location

65. Which of the following is/are determined at a point of a given beam by moment area method ?

1. Shear force
2. Bending moment
3. slope
4. deflection

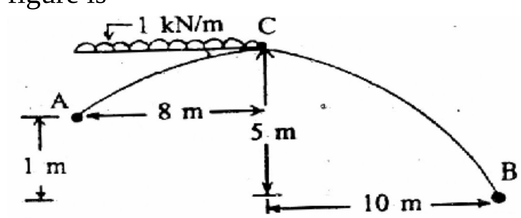
Select the correct answer using the codes given below :

a. 1 and 2
b. 3 alone
c. 4 alone
d. 3 and 4

66. Which one of the following rules ascertains the maximum permissible eccentricity of loads on circular column so that stresses will always be compressive ?

a. Middle fourth rule
b. Middle third rule
c. Middle half rule
d. Middle two-third rule

67. The horizontal thrust at support 'A' in a three hinged arch shown in the given figure is

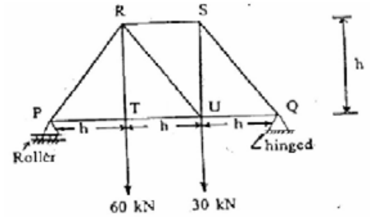


a. 2 kN
b. 4 kN
c. 8 kN
d. 10 kN

68. A three-hinged symmetrical parabolic arch of span 20 m and 5 m carries a uniformly distributed load of 2 kN/m for the whole span. The bending moment at quarter point is

a. 75 kNm (Hogging)
b. 75 kNm(Sagging)
c. 100 kNm(Sagging)
d. zero

69. Consider a loaded truss shown in the given figure. Match List I(Member) with List II(Force) and select the correct answer :



List I

A. PR

B. RS

C. SU

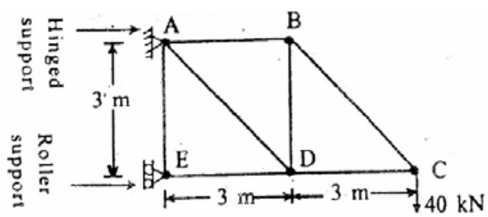
D. RT

List II

1. 40 kN(Tension)
2. 40 kN(Compression)
3. 60 kN(Tension)
4. $50\sqrt{2}$ kN(Compression)

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

70. The pin jointed cantilever truss is loaded as shown in the given figure. The force in member ED is



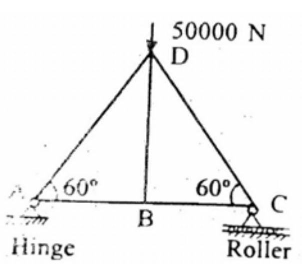
a. 40 kN(Compressive)

b. 80 kN(Tensile)

c. 80 kN(Compressive)

d. 120 kN(Compressive)

71. In the pin jointed plane frame shown in the given figure. The force in the member BD is



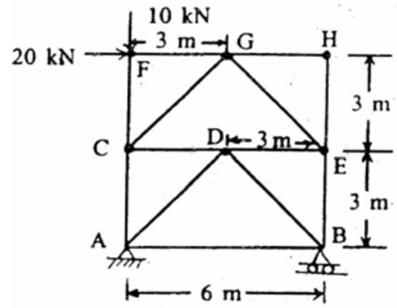
a. 50000 N (Tensile)

b. 50000 N (Compressive)

c. $50000\sqrt{2}$ N(Tensile)

d. zero

72. A loaded pin jointed truss is shown in the given figure. The force in member AC is



a. $10\sqrt{2}$ kN (Tensile)

b. $10\sqrt{2}$ kN (Compressive)

c. Zero

d. 10kN (Tensile)

73. A solid shaft has diameter 80 mm. It is subjected to a torque of 4 kNm. The maximum shear stress induced in the shaft would be

a. $75/\pi$ N/mm^2

b. $250/\pi$ N/mm^2

c. $125/\pi$ N/mm^2

d. $150/\pi$ N/mm^2

74. Two steel shaft ‘A’ and ‘B’ are used for transmitting power. The ratio of revolutions of shafts i.e. N_A / N_B = 2. The ratio of torques on shafts i.e. T_A / T_B = 1/2. The ratio of the horse power transmitted by the shaft i.e. P_A/P_B would be

a. 1/2

b. 1/4

c. 1

d. 2

75. A bar AB of diameter 40 mm and 4 m long is rigidly fixed at its ends. A torque of 600 Nm is applied at a section of the bar, 1 m from end A. The fixing couples T_A and T_B at the supports A and B, respectively, are

a. 450 Nm and 150 Nm

b. 200 Nm and 400 Nm

c. 300 Nm and 150 Nm

d. 300 Nm and 100 Nm

76. A short hollow CI column section ‘A’ is 150 cm^2 and the section modulus Z = 10×10^5 mm^3 carries

(i) an axial load of 250 kN, and

(ii) a load of 50 kN on a bracket, the load line being 500 mm from the axis of column.

The maximum and minimum stress intensities are

a. 50 N/mm^2 tensile and 10 N/mm^2 compressive
b. 45 N/mm^2 compressive and 5 N/mm^2 tensile
c. 55 N/mm^2 compressive and 5 N/mm^2 tensile
d. 60 N/mm^2 tensile and 10 N/mm^2 compressive

77. The strain energy in a member is proportional to
a. total strain multiplied by the volume of the member
b. product of stress and the corresponding strain
c. product of strain and Young's modulus of the material
d. the maximum strain multiplied by the length of the member

78. Strain energy in torsion of a shaft per unit volume is given by (q is shear stress, E-modulus of Elasticity and G is modulus of rigidity)
a. $q^2/2G$
b. $q^2/2E$
c. $q^2/4G$
d. $q^2/4E$

79. A simply supported beam of span 'L' is subjected to a concentrated load W at midspan. The strain Energy due to bending in the beam would be
a. $W^2 L^3$ / 48 El
b. $W^2 L^3$ / 96 El
c. $W^2 L^3$ / 24 El
d. $W L^3$ / 96 El

80. A mild steel bar of uniform cross-section 'A' and length L is subjected to an axial load 'W'. The Strain Energy stored in the bar would be
a. Wl/2 AE
b. W^2L/4 AE
c. WL/4 AE
d. W^2L/2 AE

81. Creep is the gradual increase of
a. plastic strain with time at constant load
b. elastic strain with time at constant load
c. plastic strain with time at varying load
d. elastic strain with time at varying load

82. If a shaft is simultaneously subjected to a torque T and a bending moment M, the ratio of maximum bending stress and maximum shearing stress is given by
a. 2M/T
b. M/T
c. 2T/M
d. T/M

83. If three close-coiled and two open-coiled helical springs, each having the stiffness k are connected in series then the overall stiffness is
a. 5 k
b. k/5
c. $k/\sqrt{5}$
d. 6k/5

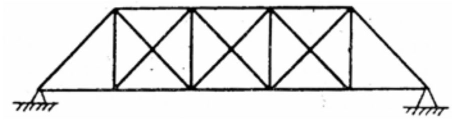
84. The ratio of tensile stress developed in the wall of a boiler in the longitudinal direction to the tensile stress in the circumferential direction due to an internal pressure is
a. 4
b. 2
c. 1/4
d. 1/2

85. In a two dimensional stress system, the two principal stresses are σ_1 of 180 N/mm^2 (tensile) and σ_2 (compressive). For the material, yield stress in simple tension and compression is 240 N/mm^2 and Poisson Ratio is 0.25. According to maximum normal strain theory, the value σ_2 of at which yielding will commence, is
a. 240 N/mm^2
b. 180 N/mm^2
c. 195 N/mm^2
d. 200 N/mm^2

86. A straight cantilever of uniform cross-section carries a load 'W' distributed evenly over its entire length. If the free end of the cantilever is now popped upto the level of the fixed end, the vertical force required at the prop is
a. 3/8 W
b. 5/8 W
c. 3/4 W

d. W

87. The total degree of indeterminacy (both internal and external) for the bridge truss shown in the given figure is



a. 4

b. 5

c. 6

d. 3

88. Which one of the following steps is NOT correct in the application of moment distribution method ?

a. The distribution factors are first computed

b. All supports are assumed fixed or locked and fixed end moments are computer for each span, considered separate from every other span

c. Each support is not unlocked and the unbalanced moment is distributed to each adjacent span. Then each support is relocked

d. After distributing the unbalanced moment to each adjacent span, one half of this amount, with opposite sign is carried over to the other end of respective span.

89. A correct solution of a statically indeterminate structure as per the energy method

a. is statically admissible

b. is kinetically consistent

c. makes the strain energy of the structure a minimum

d. can be given by (a), (b) and (c) of the question

90. While designing multistory in deeptrial structures, BIS code suggests the reduction in live loads because

a. all the floors may not be loaded simultaneously

b. cross-section of the columns are different at different floors

c. thickness of roof slab is smaller than the thickness of floor slabs

d. of the cantilevering effect of the building

91. A uniform beam of span ‘l’ is rigidly fixed at both supports. If carries a uniformly distributed load w per unit length. The bending moment at mid span is

a. $wl^2 / 8$

b. $wl^2 / 12$

c. $wl^2 / 16$

d. $wl^2 / 24$

92. Consider the following statements :

A cantilever beam of length ‘l’ is loaded with uniformly distributed load ‘w’ on the span. The beam is propped at the free end having its level same as that of the fixed end (El is constant).

1. The prop reaction is $wl / 2$
2. The prop reaction is 3/8 wl.
3. The bending moment at the prop = $wl^2/2$
4. SF is zero at x = 3/8 l from the proper end.

Which of these statements are correct ?

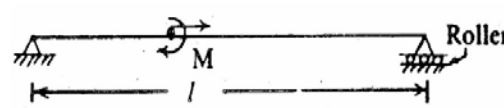
a. 1 and 3

b. 2 and 3

c. 1 and 4

d. 2 and 4

93. An applied couple ‘M’ is moving on a simply supported beam of span ‘l’ as shown in the given figure. The absolute maximum bending moment developed in the beam is



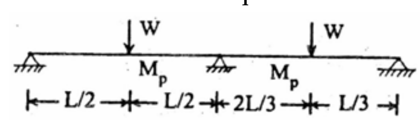
a. M/2

b. M

c. 3 M/2

d. 2M

94. A continuous beam with constant El is shown in the given figure. Collapse load for this beam will be equal to



a. 16 M_p/L

b. 12 M_p/L

c. 8 M_p/L

d. 6 M_p/L

95. Consider the following statements :

The Impact factor for reinforced concrete bridges = $\frac{4.5}{(6+L)}$ (where L is the length in metres of the span).

The bridge is designed

1. for spans upto 30 m
2. for spans between 3 m and 45 m
3. either for class A or class B loading
4. for class AA and class 70 R.

Which of these statements are correct ?

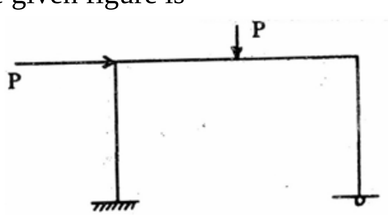
a. 1 and 3
b. 2 and 3
c. 1 and 4
d. 2 and 4

96. Which of the following statements is/are correct ?

1. Plastic hinges are reached first at sections subjected to greatest curvature.
2. Formation of plastic hinges allows a subsequent redistribution of moment until fully plastic moment is reached at each critical section.
3. The maximum load is attained when a mechanism forms.

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

97. The number of possible independent mechanisms for a portal frame shown in the given figure is



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

98. The collapse load of a simply supported beam of span L and fully plastic moment M_p subjected to central concentrated load is given by

a. 4 M_p/L
b. 6 M_p/L
c. 8 M_p/L
d. 2 M_p/L

99. A propped cantilever bean of span 'L' and constant plastic moment capacity M_p carries a concentrated load at mid span, then the load at collapse will be

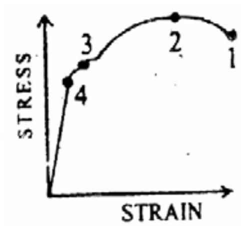
a. 8 M_p/L
b. 6 M_p/L
c. 4 M_p/L
d. 2 M_p/L

100. Match List I (Properties) with List II) Stress points labeled 1, 2, 3 and 4) in the stress-strain figure an select the correct answer :

List I

A. Yield point
B. Proportional limit
C. Rupture strength
D. Ultimate strength

List II



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

101. A simply supported beam of 8 m effective span carries uniformly distributed load of 2 kN/m (inclusive of self load) over the effective span. If the permissible bending stress is 160 MPa, then most suitable shape and size would be a

a. solid circular section of diameter = 110 mm, area = 9500 mm^2 and section modulus = 130660 mm^3
b. solid rectangular section of size 60 mm × 100 mm deep, area = 6000 mm^2 and maximum section modulus = 100,000 mm^3
c. T-section of size 200 mm × 200 mm × 10 mm thickness, area = 3900 mm^2 and maximum section modulus = 105, 780 mm^3
d. I-section of size 80 mm × 150 mm deep × 10 mm thickness, area =

$2900 mm^2$ and maximum section modulus = $129100\ mm^3$

102. Which one of the following pairs is correctly matched ?

a. Truss – Bending

b. Beam – Twisting

c. Column – Buckling

d. Shaft – Shortening

103. The maximum shear force at a section is 56 kN. An ISWB of height 350 mm, breadth 200 mm, thickness of web 8 mm, with a section modulus of 887 cm^3 is used as a beam at the section. The shearing stress is

a. 10 N/mm^2

b. 20 N/mm^2

c. 28.4 N/mm^2

d. 41.6 N/mm^2

104. M 60 structural steel tube has a radius of gyration 20 mm. The unbraced length upto which the tube can be used as a compression member, is

a. 3.6 m

b. 5.0 m

c. 6.0 m

d. 7.2 m

105. Which one of the following is the mode of failure in a fillet weld material ?

a. Tension

b. Shear

c. Bearing

d. Crushing

106. Load on connection is not eccentric for

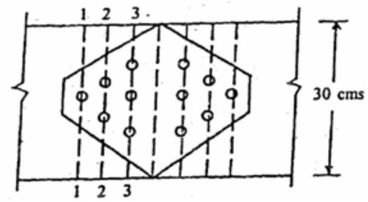
a. LAP joint

b. Single cover butt joint

c. Double cover butt joint

d. All the joints mentioned in a., b., and c. of the question

107. Two steel plates each of 12 mm thickness are connected by a double cover butt joint by rivets shown in the given figure. If the rivet diameter is 22 mm rivet force value of 53150 N and permissible stress in tension of plate is 142 N/mm^2, which one of the following section is the most critical section ?



a. Section 1–1

b. Section 2–2

c. Section 3–3

d. Both section 1–1 and section 2–2

108. Match List I with List II and select the correct answer :

List I(Methods of analysis)

A. Exact plastic analysis

B. Mechanism method of plastic analysis

C. Equilibrium method of plastic analysis

List II(Conditions satisfied)

1. Equilibrium, sufficient plastic hinges and Non-violation of plastic moment capacity
2. Equilibrium and Non-violation of plastic moment capacity
3. Equilibrium, continuity and Non-violation plastic moment capacity
4. Equilibrium and sufficient plastic hinges

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

109. The distance of centroids of areas above and below the equal area axis in a solid circular section from its centre (R is the radius of circular section) is

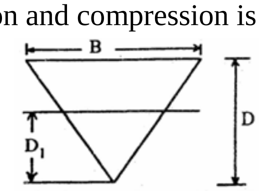
a. $4R/3\pi$

b. $4\pi/3R$

c. $3R/4\pi$

d. $3\pi/4R$

110. Neutral axis distance D_1 at plastic moment condition of a triangular cross-section in given figure having similar properties in tension and compression is



a. 2/3 D

b. D/2

c. $D/\sqrt{3}$

d. $D/\sqrt{2}$

111. Which of the following loads are to be considered in designing a gantry girder in an industrial building ?

1. Gravity loads
2. Lateral loads
3. Longitudinal loads
4. Wind loads

Select the correct answer using the codes given below :

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

112. The slenderness ratio in tension member as per BIS code where reverse of stress is due to loads other than wind or seismic shall not exceed

a. 350
b. 180
c. 100
d. 60

113. In a plate girder bridge the thickness of web is less than d'/200 where d' is the unsupported depth of web. The web plate should be provided with

a. vertical stiffness
b. horizontal stiffness
c. end stiffness
d. both vertical and horizontal stiffness

114. In the design of steel bridges if wind or seismic forces are also considered, the allowable stresses as per BIS may be increased by

a. 10%
b. $16\frac{2}{3}\%$
c. 25%
d. $33\frac{1}{3}\%$

115. The compressive strength in structural timber is minimum in a direction

a. parallel to the grains
b. perpendicular to the grains
c. along an axis inclined at 45^o to the grains
d. along an axis inclined at 60^o to the grains

116. The minimum compressive strength of first class bricks should be

a. $5\ N/mm^2$
b. $7.5\ N/mm^2$
c. $9\ N/mm^2$
d. $10\ N/mm^2$

117. Earthquake causes horizontal and vertical accelerations in the masonry structure. The magnitude of the force induced in the structure depend on the

a. age of the building
b. strength of mortar
c. type of roof
d. Mass of the structure

118. For a reinforced concrete beam section the shape of the shear stress diagram is

a. parabolic over the whole section with maximum value at the neutral axis
b. parabolic above the neutral axis and rectangular below the neutral axis
c. linearly varying as the distance from the neutral axis
d. dependent on the magnitude of shear reinforcement provided

119. In a reinforced concrete T-beam (in which the flange is in compression). The position of neutral axis will

a. be within in the flange
b. be within the web
c. depend on the thickness of flange in relation to total depth and percentage of reinforcement
d. at the junction of flange and web

120. Consider the following statements :

The reinforcement in reinforced concrete shall have concrete cove, the thickness of such cover shall be not less than

1. 25 mm
2. the diameter of bar
3. the spacing between bars
4. 5 mm

Which of the se statemtns are correct?

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