

26. Match List-I and List-II, and select the correct answer using the codes in given below list.

<b>List-I</b>	<b>List-II</b>
i. Preliminary estimate	1. Probable variation for quantity rate and amount for each items.
ii. Revised estimate	2. Material deviation of a structural nature
iii. Supplementary estimate	3. Complete estimate
iv. Quantity estimate	4. Approximate cost of the project.

**Codes:**

	(i)	(ii)	(iii)	(iv)
A.	4	1	2	3
B.	4	2	1	3
C.	3	1	2	4
D.	3	2	1	4

**Ans. (A)**

27. The total number of grades of ordinary concrete stipulated in IS : 456–2000 are

- |       |      |
|-------|------|
| A. 10 | B. 8 |
| C. 3  | D. 6 |

**Ans. (C)**

28. Two shafts of same length and material are joined in series. If the ratio of their diameters is 2, then the ratio of their angles of twist will be :

- |      |       |
|------|-------|
| A. 2 | B. 4  |
| C. 8 | D. 16 |

**Ans. (D)**

29. The mortar used for masonry construction are classified based on strength in IS : 2950 and IS : 1905 according to their designations L<sub>1</sub>, L<sub>2</sub>, H<sub>1</sub>, H<sub>2</sub>, M<sub>1</sub> and M<sub>2</sub>. The correct sequence of increasing order of their strength is

- A. L<sub>1</sub>, L<sub>2</sub>, H<sub>1</sub>, H<sub>2</sub>, M<sub>1</sub> and M<sub>2</sub>
- B. L<sub>2</sub>, L<sub>1</sub>, M<sub>2</sub>, M<sub>1</sub>, H<sub>2</sub> and H<sub>1</sub>
- C. L<sub>1</sub>, L<sub>2</sub>, M<sub>1</sub>, M<sub>2</sub>, M<sub>1</sub> and H<sub>2</sub>
- D. M<sub>1</sub>, M<sub>2</sub>, L<sub>1</sub>, L<sub>2</sub>, H<sub>1</sub> and H<sub>2</sub>

**Ans. (B)**

30. A prismatic bar in compression has a cross-sectional area A = 1200 mm<sup>2</sup> and carries a load P = 90 kN. Normal and shear stresses acting on a plane cut through the bar at

$\theta = 25^\circ$ , are respectively

- A. 61.6 MPa and 28.7 MPa
- B. 49.5 MPa and 23.8 MPa
- C. 78.2 MPa and 20.7 MPa

D. 73.4 MPa and 29.2 MPa

**Ans. (A)**

31. The minimum width of tread without nosing for staircase of residential building shall be

- A. 150 mm
- B. 190 mm
- C. 200 mm
- D. 300 mm

**Ans. (D)**

32. A cast iron column of external diameter of 300 mm is 20 mm thick. Find safe compressive load on column with factor of safety of 5, if the crushing strength of material is 550 N/mm<sup>2</sup>

- A. 1925.21 kN
- B. 1935.21 kN
- C. 1945.21 kN
- D. 1955.21 kN

**Ans. (B)**

33. The water-cement ratio for ferrocement mix should be

- A. Less than 0.35
- B. Between 0.35 to 0.40
- C. Between 0.40 to 0.50
- D. Greater than 0.60

**Ans. (C)**

34. A simply supported beam of length 6 m carries a point load at the centre of the beam such that the maximum bending moment there is 12 kN-m, if 'EI' is the flexural rigidity of the beam, the deflection at the centre is

- A.  $\frac{9}{EI}$
- B.  $\frac{18}{EI}$
- C.  $\frac{36}{EI}$
- D.  $\frac{45}{EI}$

**Ans. (C)**

35. The minimum depth of the reinforced bond provided as strengthening arrangement in masonry building is

- A. 75 mm
- B. 60 mm
- C. 50 mm
- D. 40 mm

**Ans. (A)**

36. When a body is subjected to a direct tensile stress (p) in one plane accompanied by a simple shear stress (q), the maximum normal stress is

- A.  $\frac{P}{2} + \frac{1}{2}\sqrt{p^2 + 4q^2}$
- B.  $\frac{P}{2} - \frac{1}{2}\sqrt{p^2 + 4q^2}$

C.  $\frac{P}{2} + \frac{1}{2}\sqrt{p^2 - 4q^2}$       D.  $\frac{P}{2} - \frac{1}{2}\sqrt{p^2 - 4q^2}$

**Ans. (0)**

37. Technical term 'Eaves' is defined as

- A. The apex line of the sloping roof
- B. The lower edge of the inclined roof surface
- C. Sloped triangular surface formed at the end of a roof
- D. The ridge formed by the intersection of two sloping surfaces

**Ans. (B)**

38. A ductile structure is defined as one for which the plastic deformation before fracture

- A. is smaller than the elastic deformation
- B. vanishes
- C. is equal to the elastic deformation
- D. is much larger than elastic deformation

**Ans. (D)**

39. The method suitable for measuring the workability of dry concrete mix having very low workability is

- A. Slump test
- B. Compaction factor test
- C. Vee-bee consistometer test
- D. Vicat test

**Ans. (C)**

40. The first moment of area of a rectangular section of width 'b' and depth 'h' about centre of gravity is

- A.  $\frac{b \cdot h^2}{2}$
- B.  $\frac{b \cdot h^2}{4}$
- C. Zero
- D.  $b \cdot h^2$

**Ans. (C)**

41. According to National Building Code 2016, the slope of a ramp in the building shall NOT exceed

- A. 1 in 12
- B. 1 in 10
- C. 1 in 8
- D. 1 in 6

**Ans. (A)**

42. The ratio of the stiffness of the beam at the near end when the far end is hinged, to the stiffness of the beam at the near end when the far end is fixed

- A.  $\frac{4}{3}$                       B.  $\frac{3}{4}$   
 C. 1                              D.  $\frac{1}{2}$

**Ans. (B)**

43. A property fetch a net annual income of Rs 80,000/- after deducting all outgoings. Rate of interest is 6% per annum. What is capitalized value of the property?

- A. Rs. 13,33,600/-              B. Rs 9,60,000/-  
 C. Rs 16,63,500/-              D. Rs 9,33,900/-

**Ans. (A)**

44. The deflection at the free end of a cantilever beam subjected to a couple 'M' at the free end and having a uniform flexural rigidity 'EI' throughout its length 'L' is equal to

- A.  $\frac{ML^2}{2EI}$                       B.  $\frac{ML^2}{3EI}$   
 C.  $\frac{ML^2}{6EI}$                       D.  $\frac{ML^2}{8EI}$

**Ans. (A)**

45. Match List-I and List-II, and select the correct answer using the codes given below the lists.

List-I	List-II
(i) Index plan	1. Details of plumbing service, water supply and sewage disposal system.
(ii) Key plan	2. Relative position of all the different units.
(iii) Service plan	3. General layout of a new town showing the position of roads, market, hospital, parks etc.
(iv) Layout plan	4. Details of the particular building.

**Codes:**

	(i)	(ii)	(iii)	(iv)
A.	4	3	2	1
B.	3	4	1	2
C.	3	1	2	4
D.	4	1	2	3

**Ans. (B)**

46. A three hinged arch ABC has a span of 20 m and central rise of 4 m. The arch has hinges at the end and at the centre. A train of two point loads of 20 kN and 10 kN, 5 m apart crosses this arch from left to right with 20 kN load leading. The maximum thrust induced at the support is

- A. 25 kN                              B. 32.81 kN  
 C. 28.13 kN                          D. 31.25 kN

**Ans. (D)**

47. Base of a paint is

- A. Linseed oil
- B. Poppy oil
- C. Sulphates of zinc and manganese
- D. White lead

**Ans. (D)**

48. Influence line for redundant structures can be obtained by

- A. Castigliano's theorem
- B. Unit load theorem
- C. Muller-Breslau principle
- D. Maxwell Betti's reciprocal theorem

**Ans. (C)**

49. Part of brick which has half-header face and half-stretcher face is known as

- A. Bevelled closer
- B. King closer
- C. Queen closer
- D. Bat

**Ans. (B)**

50. A single bay portal frame of height 'h' fixed at the base is subjected to a horizontal displacement 'Δ' at the top. The base moment developed is proportional to All members are prismatic.

- A.  $\frac{1}{h}$
- B.  $\frac{1}{h^2}$
- C.  $\frac{1}{h^3}$
- D. None of these

**Ans. (B)**

51. In a 'PERT' analysis, if the probability factor is negative, the chances of completing the project time is

- A. Less than 50%
- B. Fifty-fifty %
- C. More than 50%
- D. Zero

**Ans. (A)**

52. Which is the unit matrix or identity matrix in the following?

- A.  $\begin{bmatrix} 1.0 & 0.0 & 1.0 \\ 0.0 & 1.0 & 0.0 \\ 1.0 & 0.0 & 1.0 \end{bmatrix}$
- B.  $\begin{bmatrix} 1.0 & 0.0 & 0.0 \\ 1.0 & 0.0 & 0.0 \\ 1.0 & 0.0 & 1.0 \end{bmatrix}$

C.  $\begin{bmatrix} 0.0 & 1.0 & 0.0 \\ 0.0 & 1.0 & 0.0 \\ 0.0 & 1.0 & 0.0 \end{bmatrix}$       D.  $\begin{bmatrix} 1.0 & 0.0 & 0.0 \\ 0.0 & 1.0 & 0.0 \\ 0.0 & 0.0 & 1.0 \end{bmatrix}$

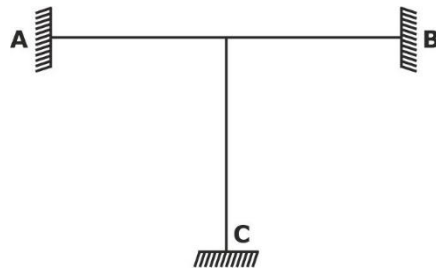
**Ans. (D)**

53. The limit state of serviceability includes

1. Deflection
  2. Repairable damage or crack due to fatigue
  3. Vibration
  4. Fire
- A. Only 1 and 3                      B. Only 1 and 4  
 C. Only 1, 3 and 4                  D. 1, 2, 3 and 4

**Ans. (D)**

54. Neglecting axial changes in lengths, determine the kinematic indeterminacy of the following frame 'ABC'.



- A. 3                                      B. 2  
 C. 1                                      D. 9

**Ans. (C)**

55. In steel structures, the thickness of the base plate in a column base is determined from the

- A. Flexural strength of plate
- B. Shear strength of plate
- C. Bearing strength of concrete pedestal
- D. Punching criteria

**Ans. (A)**

56. For a linear elastic structural system, minimization of potential energy yields

- A. Compatibility condition      B. Constitutive relationship  
 C. Equilibrium equations        D. Strain displacement relations

**Ans. (A)**

57. Match List-I and List-II and select correct answer using the codes given below the list.

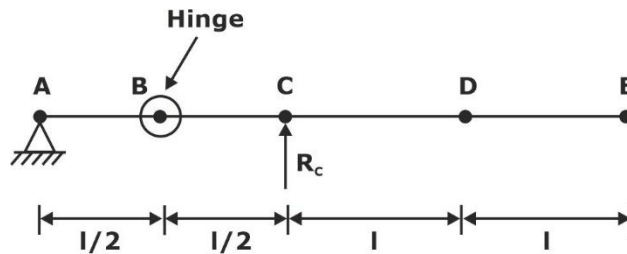
- | List-I                  | List-II  |
|-------------------------|--|
| (i) Building lease      | 1. The lease holder does not have right to spend money on construction |
| (ii) Occupational lease | 2. The lease holder can erect a building                               |
| (iii) Sub-lease         | 3. Duration of lease is given until death                              |
| (iv) Life lease         | 4. The lease holder may render lease hold property                     |

Codes:

	(i)	(ii)	(iii)	(iv)
A.	1	2	4	3
B.	2	1	4	3
C.	3	1	2	4
D.	3	2	1	4

Ans. (A)

58. The influence line for support reaction  $R_c$  for the beam shown in figure will be as



- A.
- B.
- C.
- D.

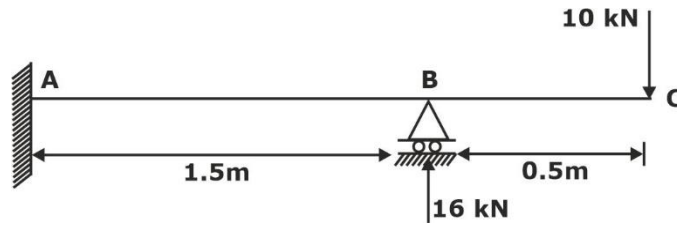
Ans. (D)

59. A propped cantilever beam of span 'L' is carrying a vertical concentrated load acting at mid span. The plastic moment of the section is  $M_p$ . The magnitude of collapse load will be

- A.  $8 M_p/L$                       B.  $6 M_p/L$   
 C.  $4 M_p/L$                       D.  $2 M_p/L$

Ans. (B)

60. A horizontal beam is shown below. The distance of the point of contraflexure from the end 'A' is



- A. 0.333 m                      B. 0.666 m  
 C. 1.50 m                      D. 0.50 m

**Ans. (B)**

61. Rivets under combined stresses must be subjected to limit as

Where,  $\tau_v$  and  $\sigma_t$  = The actual shear and tensile stresses in the rivets, respectively.

$\tau_{vf}$  and  $\sigma_{tf}$  = Allowable shear and tensile stresses in the rivets, respectively.

- A.  $\frac{\tau_v}{\tau_{vf}} + \frac{\sigma_t}{\sigma_{tf}} \leq 2.0$                       B.  $\frac{\tau_v}{\tau_{vf}} + \frac{\sigma_t}{\sigma_{tf}} \leq 1.5$   
 C.  $\frac{\tau_v}{\tau_{vf}} + \frac{\sigma_t}{\sigma_{tf}} \leq 1.0$                       D.  $\frac{\tau_v}{\tau_{vf}} + \frac{\sigma_t}{\sigma_{tf}} \leq 1.4$

**Ans. (D)**

62. Excavation was being carried out for a foundation on plastic clay with a unit weight of  $22.5 \text{ kN/m}^3$ . Failure occurred when a depth of 8.10 m was reached. What is the value of cohesion if  $\phi = 0^\circ$ ?

- A.  $11.4 \text{ kN/m}^2$                       B.  $22.8 \text{ kNm}^2$   
 C.  $45.6 \text{ kNm}^2$                       D. None of these

**Ans. (C)**

63. Match List-I and List-II and select correct answer using the codes given below the list.

List-I		List-II	
(i) Dead load		1. IS : 875 - 2015 (Part -4)	
(ii) Imposed load		2. IS : 875 - 2015 (Part -3)	
(iii) Wind load		3. IS : 875 - 2015 (Part - 2)	
(iv) Snow load		4. IS : 875 - 2015 (Part -1)	

**Codes:**

	(i)	(ii)	(iii)	(iv)
A.	4	3	2	1
B.	4	3	1	2
C.	3	4	2	1
D.	3	4	1	2

**Ans. (A)**



64. The poisson's ratio for soil sample 1 and 2 are  $\mu_1$  respectively. If  $\frac{\mu_1}{\mu_2} = 1.5$  and  $\frac{1 - \mu_1}{1 - \mu_2} = 0.875$  then ratio of coeff. Of earth pressure at rest for soil sample 1 ( $K_1$ ) to coeff. Of earth pressure at rest for soil sample 2

$(K_2), \frac{K_1}{K_2}$  will be

- A. 1.3125                      B. 1.7143  
C. 1.9687                      D. 1.8213

**Ans. (B)**

65. In the design of steel structure, for the purpose of designing any member, the load generated due to secondary effects include

1. Due to contraction or expansion from the temperature
2. Due to differential settlement of structure
3. Due to accidental loads
4. Due to eccentric connections

- A. Only 1 and 3                      B. Only 1, 2 and 3  
C. Only 1, 2 and 4                      D. 1, 2, 3 and 4

**Ans. (C)**

66. For sand of uniform spherical particles, the void ratio in the loosest and densest state, are respectively,

- A. 0.91, 0.35                      B. 0.35, 0.91  
C. 0.65, 0.09                      D. 0.09, 0.65

**Ans. (A)**

67. Prying forces are

- A. Forces due to the friction between connected parts
- B. Bending forces on the bolts because of the joints
- C. Shearing forces on the bolts because of joints
- D. Tensile forces due to the flexibility of connected parts

**Ans. (D)**

68. The constant of proportionality between seepage velocity and hydraulic gradient is called

- A. Seepage coefficient
- B. Coefficient of transmissibility
- C. Coefficient of percolation

D. Modified coefficient of permeability

**Ans. (C)**

69. In a steel plate with bolted connection the rupture of the net section is a mode of failure under

- A. Tension
- B. Compression
- C. Flexure
- D. Shear

**Ans. (A)**

70. A 300 mm square bearing plate settles by 21 mm in a plate load test on a cohesive soil, when the intensity of loading is  $0.2 \text{ N/m}^2$ . The settlement of a prototype shallow footing 1 m square ( $1 \text{ m} \times 1 \text{ m}$ ) under the same intensity of loading (considering both plate and footing are placed at same depth) is

- A. 15 mm
- B. 70 mm
- C. 50 mm
- D. 167 mm

**Ans. (B)**

71. The flange splice in plate girders is preferably placed near about

- A. Mid span section
- B. Quarter span section
- C. End section
- D. Any section

**Ans. (B)**

72. a drained triaxial compression test conducted on dry sand, failure occurred when the deviator stress was  $218 \text{ kN/m}^2$  at a confining pressure of  $61 \text{ kN/m}^2$ . The effective angle of shearing resistance and the inclination of failure plane to major principal plane will be

- A.  $34^\circ, 62^\circ$
- B.  $34^\circ, 28^\circ$
- C.  $40^\circ, 25^\circ$
- D.  $40^\circ, 65^\circ$

**Ans. (D)**

73. A steel section is subjected to a combination of shear and bending actions. The applied shear force is 'V' and shear capacity of the section is ' $V_s$ ' for such sections, high shear force (as per IS : 800 - 2007) is defined as

- A.  $V > 0.6 V_s$
- B.  $V > 0.7 V_s$
- C.  $V > 0.8 V_s$
- D.  $V > 0.9 V_s$

**Ans. (A)**

74. driven into a soft clay. The undrained strength of soil varies linearly with depth such that  $S_u = 0.22\sigma_z$ . Determine the allowable pile load capacity using total stress analysis. The factor of safety required is 2 and  $\gamma_{\text{sat}} = 17 \text{ kN/m}^3$ . Ground water is at surface.

- A. 286.1 kN
- B. 252.0 kN
- C. 95.4 kN
- D. 84.0 kN

**Ans. (A)**

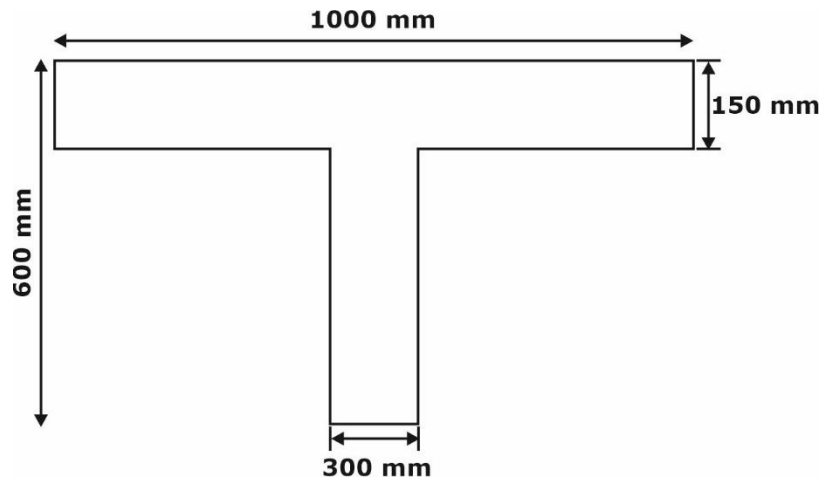
75. Torsion resisting capacity of a given RC section
- Decrease with decrease in stirrup spacing
  - Decrease with increasing the number of longitudinal bars
  - Does not depend upon stirrup and longitudinal steel
  - Increase with the increase in stirrup and longitudinal steel

Ans. (D)

76. What will be the natural frequency of a machine foundation which has a base area of  $2.20 \text{ m} \times 2.20 \text{ m}$  and a weight of  $155 \text{ kN}$  including the weight of the machine? Take the value of the coefficient of elastic uniform compression as  $4.4 \times 10^4 \text{ kN/m}^3$ .
- $26/\pi$
  - $58/\pi$
  - $116/\pi$
  - None of these

Ans. (B)

77. An isolated T-beam is used as walkway. The beam is simply supported with an effective span of  $6 \text{ m}$ . The effective width of the flange for the cross-section shown in figure is



- 900 mm
- 1000 mm
- 1259 mm
- 2200 mm

Ans. (A)

78. As per Rankine analysis, the minimum depth of foundation ( $D_{\text{min}}$ ) will be

Where,  $q$  = intensity of loading

$\gamma$  = unit wt. of over burden

$\phi$  = angle of internal friction of soil

- $\frac{q}{\gamma} \left[ \frac{1 - \sin \phi}{1 + \sin \phi} \right]^2$
- $\frac{q}{\gamma} \left[ \frac{1 - \sin \phi}{1 + \sin \phi} \right]$

C.  $\frac{q}{\gamma} \left[ \frac{1 + \sin \phi}{1 - \sin \phi} \right]$       D.  $\frac{q}{\gamma} \left[ \frac{1 + \sin \phi}{1 - \sin \phi} \right]^2$

**Ans. (A)**

79. Factored shear force of 140 kN is applied on a beam having breadth 250 mm. The beam is also subjected to factored torsional moment of 20 kN-m. The equivalent shear force on the beam is

- A. 289 kN                      B. 348 kN  
C. 268 kN                      D. 300 kN

**Ans. (C)**

80. The net ultimate bearing capacity of a purely cohesive soil

- A. Depends on both, width and depth of footing  
B. Depends on only width of footing  
C. Depends on only depth of footing  
D. Is independent of both, depth and width of footing

**Ans. (D)**

81. A reinforced concrete wall carrying vertical loads, is generally designed as per recommendations given for columns. The ratio of minimum reinforcement in the vertical and horizontal direction is

- A. 2 : 1                      B. 1 : 1  
C. 5 : 3                      D. 3 : 5

**Ans. (D)**

82. The test conducted on foundation soil gives SPT value;  $N \leq 5$  and density index,  $I_D < 20$ , the foundation will fail in

- A. General shear              B. Local shear  
C. Punching shear              D. Sinking shear

**Ans. (B)**

83. As per IS : 456 - 2000, the range of standard concrete is

- A.  $M_{25} - M_{55}$               B.  $M_{20} - M_{55}$   
C.  $M_{25} - M_{50}$               D. None of these

**Ans. (A)**

84. For any applied stress, zone of influence refers to isobar corresponding to

- A. 20%                      B. 15%  
C. 10%                      D. 5%

**Ans. (C)**

85. As per IS : 1893 - 2016, the storey drift in any storey due to minimum specified, design lateral force, with partial load factor of 1, shall NOT exceed 'X' times the storey height. The value of 'X' is
- A. 0.2020                      B. 0.002  
C. 0.040                        D. 0.004

**Ans. (D)**

86. The optimum moisture content of a clay soil is 24% whom compaction test is conducted at 30% moisture content, its structure will be
- A. Flocculated                      B. Single grained  
C. Honey comb                      D. Dispersed

**Ans. (D)**

87. The ring beam of a intze tank carries a hoop tension of 120 kN. The beam cross-section is 250 mm wide and 400 mm deep, and it is reinforced with 4 bars of 20 mm dia of Fe-415 grade. The modular ratio of concrete is 10. The tensile stress (N/mm<sup>2</sup>) in the concrete is
- A. 1.02                              B. 1.07  
C. 1.20                              D. 1.32

**Ans. (B)**

88. In a flow net drown below a sheet pile wall, the number of flow channels and head drops is 4 and 12 respectively. If the difference in the upstream and downstream water level is 3 m, what is the discharge per meter width of a sheet?  $K = 0.1$  m/sec
- A. 1 m<sup>3</sup>/s/m                      B. 0.1 m<sup>3</sup>/s/m  
C. 0.01 m<sup>3</sup>/s/m                      D. 0.001 m<sup>3</sup>/s/m

**Ans. (B)**

89. In the design of reinforced concrete beam, the requirement for bond is NOT getting satisfied. The economical option to satisfy the requirement for bond is given by
- A. Bundling of bars  
B. Providing same diameter bars more in number  
C. Providing larger diameter bars less in number  
D. Providing smaller diameter bars more in number

**Ans. (D)**

90. Shrinkage limit of clay whose void ratio in dry state is 0.55 and Sp. gravity is 2.75, will be
- A. 20%                              B. 5%  
C. 5.5%                              D. 10.0%

**Ans. (A)**

91. The flexural strength of M-30 concrete as per IS : 456-2000 is

- A. 3.83 MPa
- B. 5.47 MPa
- C. 21.23 MPa
- D. 30.00 MPa

**Ans. (0)**

92. The most useful geosynthetic physical property which is closely related to engineering performance is

- A. Thickness
- B. Mass per unit area
- C. Strength
- D. Stiffness

**Ans. (D)**

93. For a singly reinforced balanced section,  $\mu_{u, lim} = R_{u, lim} b \cdot d^2$ ; for M-20 grade concrete and Fe-415 steel, the value of  $R_{u, lim}$  will be

- A. 1.995
- B. 2.660
- C. 2.761
- D. 2.978

**Ans. (C)**

94. For the clay with an OCR of greater than 4 in a CD test, the A-factor at failure will be

- A. Zero
- B. Positive (less than 1)
- C. Negative
- D. Positive (more than 1)

**Ans. (C)**

95. A concrete beam of rectangular cross-section of 200 mm × 400 mm is prestressed with a force of 400 kN at an eccentricity 100 mm. The maximum compressive stress in concrete is

- A. 2.5 N/mm<sup>2</sup>
- B. 5.0 N/mm<sup>2</sup>
- C. 7.5 N/mm<sup>2</sup>
- D. 12.5 N/mm<sup>2</sup>

**Ans. (D)**

96. As per IS : 1892-1979; what should be the maximum thickness of cutting edge of sampling tube of 70 mm external diameter which is required for sampling in undisturbed stiff clay soil?

- A. 2.15 mm
- B. 3.05 mm
- C. 3.95 mm
- D. 6.10 mm

**Ans. (B)**

97. The lateral ties in reinforced concrete rectangular column under axial tension are used to

- A. Avoid the buckling of the longitudinal steel under compression
- B. Provide adequate shear capacity
- C. Provide adequate confinement to concrete
- D. Reduce the axial deformation of the column

**Ans. (C)**

98. What is the correct mathematical expression for the assumption 'consolidation' is occurring under small changes in effective stress made in arriving the differential equation for transient flow during one dimensional consolidation? All are standard notations.

- A.  $a_v = \text{constant}$                       B.  $\frac{1}{(1 + e_0)} dx.dy.dz = \text{constant}$
- C.  $\gamma_w = \text{constant}$                       D.  $h = \frac{u}{\gamma_w}$

**Ans. (A)**

99. Fire resistance of RCC member depends upon

1. Member size
  2. Cover of steel reinforcement
  3. Type of aggregate
- A. Only on 2                                      B. Only on 1 and 2
- C. Only on 2 and 3                              D. 1, 2 and 3

**Ans. (D)**

100. A 16-pile group has to be proportioned in a uniform pattern in a soft clay with equal spacing in both directions. Assuming any value of cohesion, taking  $\alpha = 0.7$ , neglecting the end bearing effect and assuming pile circular of diameter 'd', the optimum spacing (s) of piles in group will be

- A. 1.6 d    B. 2.6 d
- C. 3.3 d    D. 4 d

**Ans. (B)**

101. The principle used in finding the recoil velocity of a gun is

- A. Work-energy principle
- B. Energy conservation principle
- C. Conservation of linear momentum
- D. Newton's law of collision

**Ans. (C)**

102. What is the critical height of the slope of infinite extent having a slope angle =  $25^\circ$ , if it is made of clay having  $C = 30 \text{ kN/m}^2$ ,  $\phi = 20^\circ$ ,  $e = 0.65$  and  $G_s = 2.7$ , when the slope is submerged?

- A. 22.25 m                                      B. 6.51 m
- C. 35.40 m                                      D. 40.23 m

**Ans. (C)**

103. A simply supported beam of span 'l' carries a uniformly variable load of intensity  $w_0x$  over its entire span. Maximum bending moment in the beam is

- A.  $\frac{w_0l^3}{27}$                       B.  $\frac{w_0l^3(\sqrt{3})}{27}$   
C.  $\frac{w_0l^3(\sqrt{2})}{9}$                       D.  $\frac{w_0l^3}{9}$

**Ans. (B)**

104. Due to rise in temperature, the viscosity and unit weight of a fluid percolating through a soil mass, are reduced to 80% and 90% respectively, if other factors remain unaltered, the coefficient of permeability

- A. Increases by 12.5%              B. Decreases by 12.5%  
C. Increases by 28%                D. Decreases by 28%

**Ans. (A)**

105. The centroid of semicircular area of radius 'r' is

- A.  $\frac{3r}{4\pi}$                               B.  $\frac{3r}{5\pi}$   
C.  $\frac{4r}{3\pi}$                               D.  $\frac{5r}{3\pi}$

**Ans. (C)**

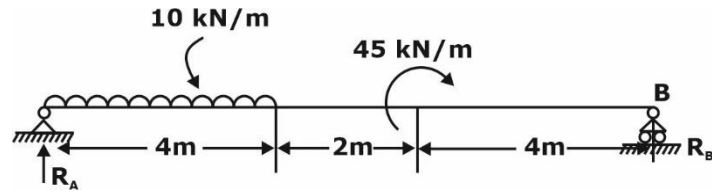
106. The principal design criteria for foundations for reciprocating machinery are follows:

1. The natural frequency should be atleast 40% away from the operating speed of the machine.
  2. The amplitude of motion of the foundation should not exceed 0.2 mm.
  3. The pressure on soil should be within the respective permissible values.
  4. For preliminary design, the maximum pressure on soil due to static load alone may be taken as 0.4 times the corresponding safe bearing capacity.
- A. 1, 2, 3 and 4 are correct  
B. 1, 3 and 4 are correct  
C. 3 and 4 are correct  
D. 2, 3 and 4 correct

**Ans. (D)**

107. The vertical support reactions  $R_A$  and  $R_B$  for the given beam is





- A.  $R_A = 25 \text{ kN}, R_B = 15 \text{ kN}$
- B.  $R_A = 15 \text{ kN}, R_B = 25 \text{ kN}$
- C.  $R_A = 12.5 \text{ kN}, R_B = 27.5 \text{ kN}$
- D.  $R_A = 27.5 \text{ kN}, R_B = 12.5 \text{ kN}$

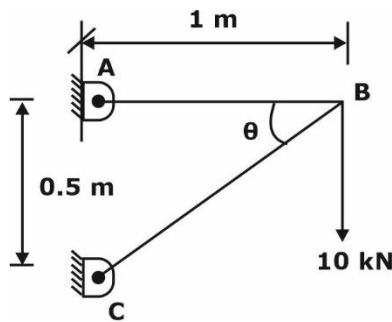
**Ans. (D)**

108. The grip length for well foundation of railway bridges is taken as \_\_\_\_\_ of maximum scour depth, generally, while for road bridges \_\_\_\_\_ of maximum scour depth is considered adequate.

- A. 30% and 30% respectively
- B. 50% and 30% respectively
- C. 30% and 50% respectively
- D. 50% and 50% respectively

**Ans. (B)**

109. A two members truss ABC as shown in figure. The axial force (in kN) transmitted in member AB is



- A. 40 kN
- B. 10 kN
- C. 20 kN
- D. 20 kN

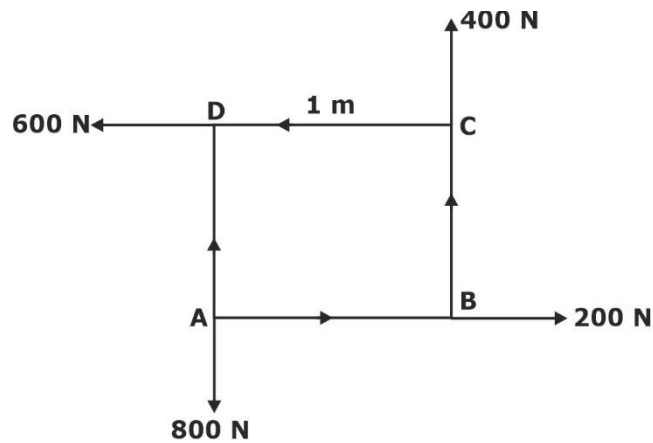
**Ans. (C)**

110. The total and effective vertical normal stresses at a depth of 5 m below the top level of water in a 7 m deep fresh water lake are respectively

- A. Zero and zero
- B.  $0.5 \text{ kg/cm}^2$  and  $0.5 \text{ kg/cm}^2$
- C.  $0.5 \text{ kg/cm}^2$  and zero
- D.  $1.0 \text{ kg/cm}^2$  and  $0.5 \text{ kg/cm}^2$

**Ans. (C)**

111. Four forces having magnitudes of 200 N, 400N, 600N and 800N, respectively acting along four sides (1 m each) of a square ABCD as shown in figure. Determine the magnitude and direction of the resultant force from 'A' along the line 'AB'.



- A.  $400\sqrt{3}$  N, 3.2 m from A  
 B.  $400\sqrt{2}$  N, 2.5 m from A  
 C.  $300\sqrt{2}$  N, 2 m from A  
 D.  $300\sqrt{3}$  N, 2.5 m from A

**Ans. (B)**

112. Group of the constituents of cement in decreasing order of their contribution to the strength of cement is

- A.  $C_3S$ ,  $C_2S$ ,  $C_3A$  and  $C_4AF$     B.  $C_2S$ ,  $C_3S$ ,  $C_3A$  and  $C_4AF$   
 C.  $C_2S$ ,  $C_4AF$ ,  $C_3A$  and  $C_3S$     D.  $C_3S$ ,  $C_3A$ ,  $C_2S$  and  $C_4AF$

**Ans. (A)**

113. A bullet of mass 30 gm leaves the barrel of a gun with a velocity of 500 m/s. Suppose, the force lasted, for 0.0018 seconds, the average impulsive force is

- A. 533.33 N                                    B. 6333.33 N  
 C. 7333.33 N                                    D. 8333.33 N

**Ans. (D)**

114. The time which results in the least possible construction cost of an activity is known as

- A. Normal time                                    B. Optimum time  
 C. Crash time                                    D. Standard time

**Ans. (B)**

115. A particle undergoes a simple harmonic motion, the acceleration of the particle at a distance of 1.5 m from the centre of motion being  $6 \text{ m/s}^2$ , the time of oscillation in seconds is

- A. 2.00
- B. 4.00
- C. 3.14
- D. 6.28

**Ans. (C)**

116. Which of the following constituent, present in excess quantity, changes the colour of the brick from red to yellow ?

- A. Alumina
- B. Silica
- C. Lime stone
- D. Iron Pyrite

**Ans. (C)**

117. The coefficient of friction is the ratio of

- A. Limiting friction force to the normal reaction
- B. Limiting friction force to the weight of body to be moved
- C. Sliding friction force to the normal reaction
- D. None of the above

**Ans. (A)**

118. Addition of fibres in concrete results in

- A. Modest increase in compressive strength
- B. Increase in ductility
- C. Enhanced toughness
- D. All of the above

**Ans. (D)**

119. The D'Alembert principle

- A. is a hypothetical principle
- B. provides no special advantage over Newton's law
- C. is based upon the existence of inertia Force
- D. Allows a dynamical problem to be considered as a static problem

**Ans. (D)**

120. A pozzolanic material must be composed mainly of

- A. Microscopic silica
- B. Microscopic and Amorphous silica
- C. Microscopic and Crystalline silica
- D. All of the above

**Ans. (B)**

121. Lamé's equations are applicable for

- A. Thick cylinder
- B. Thin cylinder
- C. Thin spherical vessel
- D. Beams

**Ans. (A)**

122. Blow holes in concreting are result of

- A. Excess water-cement ratio
- B. Insufficient workability
- C. Improper design of shuttering
- D. None of the above

**Ans. (C)**

123. A cylindrical boiler 1.5 m diameter and made up of 10 mm thick plate is subjected to steam pressure of 2 N/mm<sup>2</sup>. The hoop tension and longitudinal stresses will be

- A. 150 N/mm<sup>2</sup> and 75 N/mm<sup>2</sup>
- B. 150 N/mm<sup>2</sup> and 150 N/mm<sup>2</sup>
- C. 75 N/mm<sup>2</sup> and 75 N/mm<sup>2</sup>
- D. 75 N/mm<sup>2</sup> and 150 N/mm<sup>2</sup>

**Ans. (A)**

124. Probability distribution curve, fit well for PERT analysis, is

- A. Normal distribution curve
- B. Beta distribution curve
- C. Unimodal curve
- D. None of the above

**Ans. (B)**

125. In terms of bulk modulus (K) and modulus of rigidity (C), the Poisson's ratio can be expressed as

- A.  $\frac{3K - 4C}{6K + 4C}$
- B.  $\frac{3K + 4C}{6K - 4C}$
- C.  $\frac{3K - 2C}{6K + 2C}$
- D.  $\frac{3K + 2C}{6K - 2C}$

**Ans. (C)**