1. Blue baby disease (methaemoglaobinemia) in children is caused by :

(A) Nitrate (B) Chloride

(C) Fluoride (D) Lead

2. Bowditch rule is applied to :

(A) an open traverse for graphical adjustment.

(B) calculate the latitude and departure.

(C) a closed traverse for adjustment of closing error.

(D) all of the above

3. The fore bearing of a line measured as 200°, the back bearing of the line in quadrantal bearing form is :

(A) S 20° W (B) S 70° W

(C) N 20° E (D) N 70° E

4. To have zero active pressure intensity at the top of a wall in cohesive soil, one can apply a uniform surcharge of intensity.

(A) $2c \cot \alpha$ (B) $2c \tan \alpha$

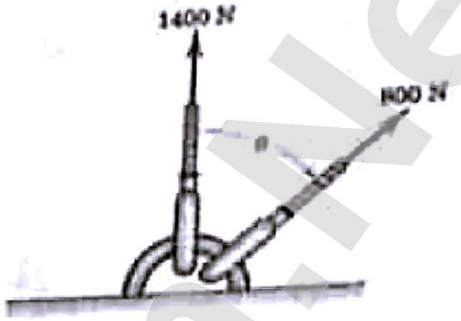
(C) $-2c \cot \alpha$ (D) $-2c \tan \alpha$

5. The ultimate bearing capacity of a soil is 310 kN/m^2, the depth of foundation as 0.8 m and bulk unit weight as 20 kN/m^3. If the factor of safety is 3, what will be the safe bearing capacity (kN/m^2) ?

(A) 98 (B) 114

(C) 100.67 (D) 108.67

6. At what angle must the 800-N force be applied in order that the resultant R of the two forces has a magnitude of 2000 N ?



(A) $\cos^{-1}(3/8)$

(B) $\cos^{-1}(-5/8)$

(C) $\cos^{-1}(5/8)$

(D) $\cos^{-1}(-3/8)$

7. Wetted perimeter of a regime channel for discharge of 64 cumec as per Lacey's theory will be :

(A) 76 m (B) 56 m

(C) 48 m (D) 38 m

8. Among the clay minerals, the one having the maximum swelling tendency is :

(A) Kaolinite (B) Illite

(C) Montmorillonite (D) Halloysite

9. When bolts are subjected to reversal of stresses, the most suitable type of bolt is :

(A) black bolt.

(B) turned and fitted bolt.

(C) high strength bolt.

(D) ordinary unfinished bolt.

10. On which canal system the theory of stable channel is given by R.G. Kennedy ?

(A) Krishna Western Delta Canals

(B) Upper Bari Doab Canals

(C) Upper Chenab Canals

(D) Upper Doab Canals

11. In flexure, the maximum strain in tension reinforcement in the section at failure shall not be less than :

(A) 0.0020

(B) 0.0035

(C) $\frac{f_y}{1.15E_s} + 0.002$

(D) $\frac{f_y}{1.15E_s} + 0.0035$

Where, f_y is characteristic strength of steel, and E_s is modulus of elasticity of steel.

12. In a network, the critical path in terms of time from beginning to end :

(A) is the shortest path

(B) is the longest path

(C) has slack > 0

(D) both (A) and (C)

13. Choose the correct statement

(A) Tresca criterion is generally used in practice because it is conservative

(B) τ_{oct} is related to the root-mean-square of the principal stress differences.

(C) Tresca criterion is easier to visualize in terms of Mohr's Circle as compared to Von-Mises one.

(D) All of the above

14. Dummy Activity is a type of activity which :

(A) is an artificial activity

(B) does not consume time

(C) does not consume Resources

(D) all of the above

15. Warping joints in the pavements are :

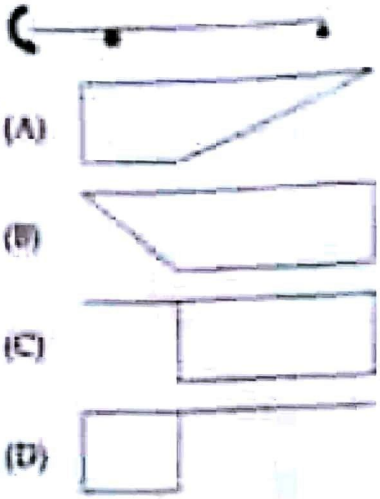
(A) known as hinged joints.

(B) provided to relieve stresses.

(C) rarely needed if the suitably designed expansion and contraction joints are provided to prevent cracking.

(D) all of the above

16. The correct shape of Shear force diagram for the following simply supported overhanging beam is



(A)

(B)

(C)

(D)

17. In deriving the equation of the hydraulic jump in a rectangular channel in terms of conjugate depths and initial Froude number :

(A) energy and continuity equations are used

(B) continuity and momentum equations are used

(C) energy, momentum and continuity equations are used

(D) None of the above

18. Choose **incorrect** statement with reference to Flat Slabs.

(A) The drops when provided shall be rectangular in plan.

(B) A flat slab may be solid or may have recesses formed on the soffit.

(C) Middle strip means a design strip bounded on each of its opposite sides by the column strip.

(D) None of the above

19. The increase in volume in a thin cylinder 6mm thick, 200mm internal diameter, 1m long, due to 4MPa internal pressure is : (Take E = 200 GPa, $\nu = 0.25$)

(A) 5 cc (B) 5000 cc

(C) 5000π cc (D) 5π cc

20. For a very heavily over-consolidated clay sample, the probable value of pore pressure parameter A at failure is likely to be :

(A) 0.85 (B) 0.33

(C) 0.0 (D) 0.20

21. The characteristic yield strength of different steel shall be assumed as :

(A) maximum yield stress/0.2 percent proof stress

(B) minimum yield stress/0.2 percent proof stress

(C) proof stress/0.2 maximum yield stress

(D) proof stress/0.2 minimum yield stress

22. To make resultant of the following coplanar forces horizontal, F (in kN) should be :

(A) $200/\sqrt{3}$

(B) $200/3$

(C) $100(1+\sqrt{3})/3$

(D) $200(1+\sqrt{3})/3$

23. The maximum shear stress in a beam of circular cross section is :

(A) $\frac{4F}{3\pi R^2}$ (B) $\frac{5F}{4\pi R^2}$

(C) $\frac{3F}{4\pi R^2}$ (D) $\frac{3F}{2\pi R^2}$

where, F is shear force, and R is the radius of cross section.

24. Castigliano's theorem :

(A) is a tool for the analysis of statically indeterminate structures.

(B) is based on the energy concept.

(C) can be derived from Betti's generalized reciprocal theorem.

(D) is valid for all above

25. Optimum mortar mix (Cement : Sand) for maximum masonry strength with bricks of strength 5-14.9 MPa is :

(A) 1 : 6 (B) 1 : 5

(C) 1 : 4 (D) 1 : 3

26. The uniform work platform, which has a mass per unit length of 25 kg/m, is simply supported by cross rods A and B. The 90-kg construction worker starts from point B and walks to the right. At what location x will be the combined moment of the weights of the man and platform about point B be zero ?

(A) Around 2.5m (B) Around 4m

(C) Around 1.5m (D) Around 3m

27. The hook length of vertical hoops in beam-web-reinforcement should be :

(A) 10d (≥ 75 mm)

(B) 8d (≥ 75 mm)

(C) 8d (≥ 100 mm)

(D) 10d (≥ 100 mm)

Where d is diameter of bar

28. A circular shaft of 10 cm radius is subjected to a torque of 10π kN-m, the maximum shear stress (in MPa) developed in the shaft is :

(A) 2 (B) 20

(C) 200 (D) 2000

29. If p is the standard consistency of cement, the amount of water used in conducting the initial setting time test on cement is :

(A) 0.65 p (B) 0.85 p

(C) 0.50 p (D) 1.10 p

30. Chlorine demand of water is equal to :

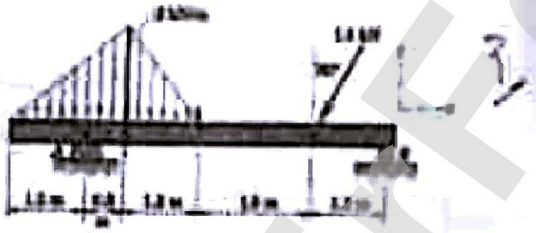
(A) applied chlorine

(B) residual chlorine

(C) sum of Applied chlorine and Residual chlorine

(D) the difference of Applied chlorine and Residual chlorine

31. The reaction at B for the beam subjected to a combination of distributed and point loads is :



(A) 1.375 kN (B) 1.75 kN

(C) 1.224 kN (D) 2.25 kN

32. Which of the following conditions is considered as the rapid closure of valve ?

(A) The duration of valve closure is greater than 2L/C

(B) The duration of valve closure is less than 2L/C

(C) The duration of valve closure is greater than L/C

(D) None of the above

Where, L is length, and C is wave velocity

33. (Fill the correct option)

For mass plain concrete, plums above 160 mm and upto any reasonable size may be used upto a maximum limit of _____ percent by volume of concrete.

(A) 10 (B) 15

(C) 20 (D) 25

34. Negative skin friction is the :

(A) additional load due to compression of fill

(B) load reduction due to compression of fill

(C) additional load due to expansion of soil

(D) load reduction due to friction of soil

35. In a rectangular channel the alternate depths are 1.5 m and 2.5 m respectively. The specific energy head (in m) is :

(A) 3.38 (B) 3.06

(C) 2.94 (D) 2.85

36. A mass curve of rainfall is a plot of :

(A) the maximum intensity of rainfall against time

(B) the intensity of rainfall against time

(C) the accumulated precipitation against time

(D) None of the above

37. Two important constituents in the composition of steel rails are :

(A) carbon and manganese

(B) carbon and phosphorus

(C) carbon and sulphur

(D) carbon and silicon

38. The following pin-connected structure is statically :

(A) indeterminate to the third degree.

(B) indeterminate to the second degree.

(C) indeterminate to the first degree.

(D) determinate.

39. Choose the correct statement for unidirectional pressure (p) :

(A) The centre of the Mohr's Circle is at the origin.

(B) The centre of the Mohr's Circle is at a distance of p.

(C) The radius of Mohr's Circle is p/2.

(D) None of the above

40. The bending stress (MPa) in a fibre distant 3cm from Neutral Axis in a simply supported beam (d = 10cm, b = 6cm) of span 2m and carrying a uniformly distributed load of 2kN/m on whole span is :

(A) 10 (B) 6×10^{-6}

(C) 6×10^{-3} (D) 6

41. The degree of static indeterminacy up to which column analogy method can be used is :

(A) unrestricted (B) 2

(C) 3 (D) 4

42. The rate of laminar Newtonian flow in a capillary tube of radius r is proportional to :

(A) r (B) r^2

(C) r^3 (D) r^4

43. (Fill in the blank with correct option) Bending moment at any section in a conjugate beam gives _____ in the actual beam.

(A) deflection (B) slope

(C) curvature (D) shear force

44. The design speed (in km/hr) recommended by IRC for National Highways passing through rolling terrain is in the range of :

(A) 100-80 (B) 80-65

(C) 120-100 (D) 110-90

45. Which of the following pavements are most suitable for black cotton soils ?

(A) Rigid Pavements

(B) Flexible pavements

(C) Semi-Rigid Pavements

(D) Any of the above

46. Side face reinforcement in the beam is provided when the depth of web exceeds :
(A) 300 mm (B) 750 mm
(C) 1000 mm (D) 1250 mm

47. Choose correct statement :
(A) Summation of normal stresses are unchanged while transforming into other frames.
(B) The analyses of dams, retaining walls, pipeline are examples of plane strain problem.
(C) The plane stress problems are in which in one direction normal stress is zero but not strain.
(D) All the above

48. As per Indian Standards, the measurement of sand is done by making use of a box of size (in cm) :
(A) $40 \times 35 \times 25$ (B) $35 \times 25 \times 15$
(C) $50 \times 40 \times 30$ (D) $50 \times 30 \times 20$

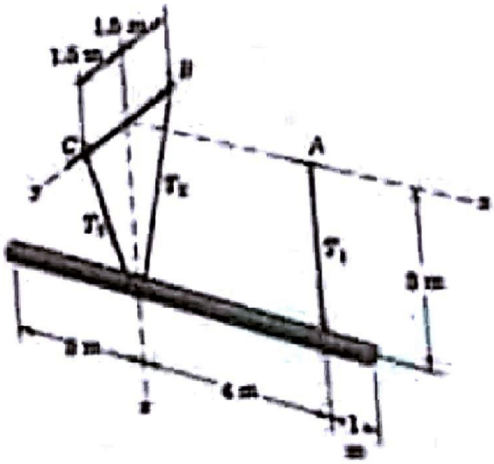
49. The acceleration of fluid particle in steady and non-uniform one dimensional flow is :
(A) 0 (B) $\frac{du}{dx}$
(C) $u\frac{du}{dx}$ (D) None of the above

50. The cause(s) of creep in the rails is/are :
(A) ironing effect of the wheels.
(B) starting and stopping operations.
(C) temperature changes.
(D) all the above

51. Turbidity is measured on :
(A) Standard cobalt scale
(B) Standard silica scale
(C) Standard platinum scale
(D) Platinum cobalt scale

52. Common burnt clay bricks of class designation "35" has :
(A) maximum compressive strength as 35 MPa.
(B) average compressive strength not less than 350 kg/cm^2.
(C) minimum compressive strength as 35 MPa.
(D) compressive strength more than 35 MPa.

53. The horizontal steel shaft has a mass of 480 kg and is suspended by a vertical cable from A and by a second cable BC which lies in a vertical transverse plane and loops underneath the shaft. The tensions T_1 and T_2 in the cables respectively are :



(A) 1177 N and 1974 N
(B) 120 N and 201 N
(C) 120 N and 180 N
(D) 1177 N and 7766 N

54. Choose the correct statement regarding reinforcement splicing

(A) The splices should as far as possible be away from the sections of maximum stress and be staggered.

(B) The splices in the flexural members should not be at sections where the bending moment is more than 50% of the moment of resistance.

(C) Not more than half the bars should be spliced at a section.

(D) All of the above

56. Which of the following is not water borne disease ?

(A) Typhoid (B) Malaria

(C) Dysentery (D) Cholera

57. The aggregate for concrete should comply with the requirements of

(A) IS 2386 (B) IS 383

(C) IS 455 (D) IS 457

55. (Choose most precise statement) The difference between constructing an influence line and constructing shear or moment diagrams is that the :

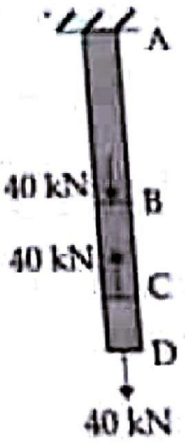
(A) Influence lines represent the effect of moving loads, whereas shear and moment diagrams represent the effect of fixed loads.

(B) Influence lines represent the effect of loads at a specified point on a member, whereas shear and moment diagrams represent the effect of loads at all points.

(C) Influence lines represent the effect of a moving load only at a specified point on a member, whereas shear and moment diagrams represent the effect of fixed loads at all points along the axis of the member.

(D) Influence lines represent the effect of a moving load only at a specified point, whereas shear and moment diagrams represent the effect of fixed loads at all points.

58. A rod of $10mm^2$ area of cross section as shown in the figure ($AB = 2BC = 4CD = 1000mm$) has $E = 200$ GPa is subjected to loads at different locations. Find change in length in section AB.



(A) 20mm decrease

(B) 20mm increase

(C) 0.2mm increase

(D) 0.4mm increase

59. A soil sample of G = 2.7 has a degree of saturation of 40% at a water content of 20%. The void ratio of sample is :

(A) 1.35

(B) 0.03

(C) 5.4

(D) none of these

60. The Flow Index of a soil indicates :

(A) variation of the plastic limit.

(B) the ratio of liquid limit to plastic limit.

(C) variation of shear strength with water content.

(D) difference of liquid limit and shrinkage limit.

61. A slope is considered infinite when ?

(A) its length in the third dimension is infinite.

(B) the slant height is very large.

(C) the base of embankment is very long.

(D) all of these

62. A BOD of a town 25,000 kg/day and BOD per capita per day is 50 g. The population equivalent of town is :

(A) 10,000 (B) 5,000

(C) 12,50,000 (D) 5,00,000

63. PERT is preferred in planning because it is :

(A) appropriate for high precision time estimate.

(B) for repetitive nature of project.

(C) event oriented.

(D) Both (A) and (C).

64. Which of the following methods is not displacement method ?

(A) Moment distribution method

(B) Column analogy method

(C) Slope deflection method

(D) Stiffness (Matrix) method

65. A 6-hour rainstorm with hourly intensities of rainfall of 5, 16, 23, 15, 9 and 1 mm/hr produces a run-off of 37 mm then the ϕ-index is :

(A) 7.5 mm/hr (B) 6.5 mm/hr

(C) 5.33 mm/hr (D) 4.5 mm/hr

66. Minimum period before striking formwork for 'props to beam and arches' of span over 6.0 m is :

(A) 7 days (B) 14 days

(C) 21 days (D) 3 days

67. In an element, strains were measured as $\varepsilon_x = 2.0 \times 10^{-4}$, $\varepsilon_y = 4.0 \times 10^{-4}$ and $\varepsilon_z = 4.0 \times 10^{-4}$. Find summation of spherical component of the stresses $(\sigma_x + \sigma_y + \sigma_z)$. Take $E = 2 \times 10^5$ MPa, $\nu = 0.3$.

(A) 900 MPa
(B) 285.7 MPa
(C) 192.3 MPa
(D) 123 MPa

68. Elastic stress in a rod due to temperature change is given by :

(A) $\alpha T E/(1-\nu)$
(B) $\alpha T E(1-\nu)$
(C) $\alpha T E$
(D) $\alpha TE(1-2\nu)$

Where, α, T, E and ν are coefficient of linear expansion, temperature change, Modulus of Elasticity, and Poisson's Ratio respectively.

69. The entry of foul smelling gases into the house coming from the sewers can be prevented by :

(A) exhaust Fan
(B) providing water seal for all the fixtures
(C) providing water seals for all the fixtures and vent pipe in the plumbing systems
(D) providing sufficient vent pipes in the plumbing systems

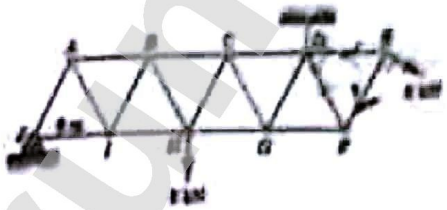
70. The minimum water cement ratio for cement concrete to hydrate is :

(A) 0.25
(B) 0.35
(C) 0.45
(D) 0.60

71. The moment which makes all the fibre at the section to yield is known as

(A) flexural rigidity
(B) plastic moment capacity
(C) moment of resistance
(D) yield moment

72. In the following truss, the force in member DF is :



(A) 2.5 kN (Comp)
(B) 5√3 kN (Tensile)
(C) 5 kN (Comp)
(D) 5/√3 kN (Tensile)

73. When sewage enters a flowing river, the rapid depletion of dissolved oxygen is due to :

(A) respiratory activity of aquatic plants in the river
(B) microbial activity
(C) suspended particles in rivers and waste
(D) none of the above

74. A sewage with a concentration of 400 ppm is flowing at a rate of 100 lps into a river. The river which has a concentration 20 ppm is flowing at a rate of 400 lps. The concentration of resulting mixture will be :

(A) 96 mg/l
(B) 100 mg/l
(C) 114 mg/l
(D) 324 mg/l

75. Which of the following stones has more fire resistance capacity ?

(A) Limestone

(B) Marble

(C) Granite

(D) Compact sandstone

76. The shape of the STOP sign board on the roads is :

(A) octagonal (B) hexagonal

(C) circular (D) triangular

77. Plastic collapse is defined as the failure stage at which :

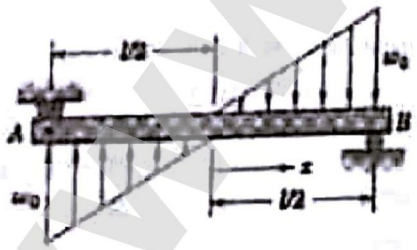
(A) plastic hinges have formed in all the members.

(B) the stresses in all the members crosses yield point.

(C) sufficient number of plastic hinges have formed due to the loads (actions) in a structure leading to a failure mechanism.

(D) any of the above

78. The magnitude of the bending moment at the mid of the span in the beam shown is :



(A) $w_0 l^2/12$ (B) $w_0 l^2/24$

(C) maximum (D) zero

79. For a solid cantilever slab carrying single concentrated load, the effective width (b_{ef}) is calculated in accordance with (provided it should not exceed 1/3 of the length of slab)

(A) $a_1 - 1.2a$ (B) $1.2\,a_1 - a$

(C) $1.2\,a_1 + a$ (D) $a_1 + 1.2a$

where, a_1-distance of concentrated load from the face of cantilever support ; a-width of contact area of the concentrated load.

80. Which of the following in timber is caused by fungus ?

(A) upsets (B) foxiness

(C) dry rot (D) wet rot

81. When a column terminates into a footing or mat, special confining reinforcement shall extend into the footing or mat at least to :

(A) 200 mm (B) 300 mm

(C) 400 mm (D) 500 mm

82. The deformation produced by a unit load is called :

(A) Stiffness

(B) Unit strain

(C) Unit displacement

(D) Flexibility

83. For a simply supported beam of 30 m span, the span to effective depth ratio for limiting the vertical deflection should not be greater than :

(A) 7 (B) 20

(C) 26 (D) 10

84. A river training work generally required when the river is of :

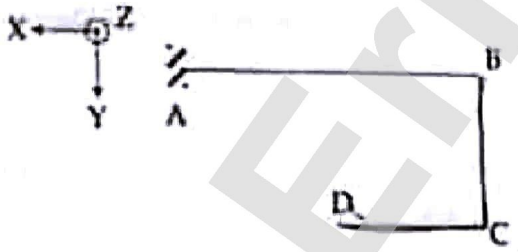
(A) aggrading type

(B) degrading type

(C) meandering type

(D) both (A) and (B)

85. Pick the correct statement for the frame (when CD = BC = ½ AB = L) given below. The joint D is subjected to point loads in all three (x, y, z) positive directions.



(A) Reactions at joint-C are Forces in all directions, and moments on all planes.

(B) Reactions at joint-B are Forces in all directions, and moments on all planes.

(C) Reactions at joint-A are Forces in all directions, and moments on all planes.

(D) None of the above

86. [illegible] follows the :

(A) Probabilistic approach

(B) Deterministic approach

(C) Both Probabilistic and Deterministic approaches

(D) None of the above

87. Ground water is generally free from :

(A) suspended impurities

(B) dissolved impurities

(C) both Suspended impurities and dissolved impurities

(D) none of the above

88. A project is expected to take 30 months along the critical path having a standard deviation of 6 months. Find the probability factor for completing the project within 27 months.

(A) 0.8 (B) 0.5

(C) 0.3 (D) 0.1

89. The inclination of lacing bars with the axis of the built-up member should be in between :

(A) 30°-70° (B) 30°-60°

(C) 40°-60° (D) 40°-70°

90. A student in an examination takes not less than 10 minutes to answer a question and sometimes he/she takes as much as 15 minutes. Most frequently he/she takes 12 minutes to answer a question. If this performance is represented an activity in PERT project, estimate expected time to answer a question and its variance.

(A) 15.7 and 0.9

(B) 14.7 and 0.59

(C) 12.17 and 0.69

(D) None of the above

91. Stress path is :

(A) Continuous representation of successive states of stress that a soil sample passes through during test.

(B) obtained by plotting the experimental data on p-q coordinates.

(C) is always a straight line

(D) all of the above

92. The influence of temperature on the modulus of elasticity is taken as follows for structures of mild steels and high strength low alloy steels when temperature, T (in degrees) is>0 but ≤600°C :

(A) $\frac{E(T)}{E(20)} = \frac{T}{2000 \times \ln\left(\frac{T}{1100}\right)}$

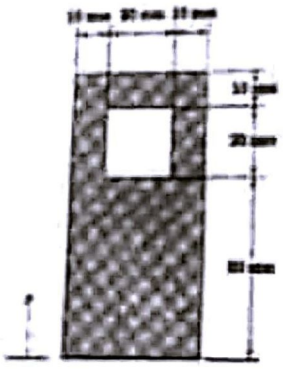
(B) $\frac{E(T)}{E(20)} = 1.0 + \left[\frac{T}{2000 \times \ln\left(\frac{T}{1100}\right)}\right]$

(C) $\frac{E(T)}{E(20)} = \frac{690\left[1 - \frac{T}{1000}\right]}{T - 53.5}$

(D) $\frac{E(T)}{E(20)} = 1.0 + \frac{690\left[1 - \frac{T}{1000}\right]}{T - 53.5}$

Where E(T) is Modulus of elasticity at temperature T, and E(20) is the modulus of elasticity at 20°C

93. The Y-coordinate of the centroid of the shaded area is :



(A) 37.1 mm (B) 42.9 mm

(C) 34.5 mm (D) 32.4 mm

94. For quality control of 16-30 m^3 concrete, the number of samples to be tested is :

(A) 3 (B) 4

(C) 5 (D) 6

95. When there is no proper quality control for making the concrete for mix proportioning, the assumed standard deviation shall be increased by :

(A) 0.5 MPa (B) 1.0 MPa

(C) 1.5 MPa (D) 2.0 MPa

96. Which one of the following pressure unit represents the greatest value of pressure ?

(A) millibar

(B) mm of mercury

(C) N/mm^2

(D) kgf/cm^2

97. Maximum effective slenderness ratio for compression flange of a beam against lateral torsional buckling is :

(A) 300 (B) 250

(C) 180 (D) 150

98. The ratio of the energy input in the modified compaction test over the energy input in the standard compaction test is :

(A) 1:1.1 (B) 1.1:1

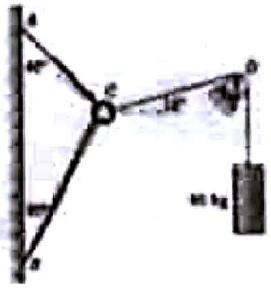
(C) 1.5:1 (D) 4.5:1

99. A sand deposit ($e = 0.67$, $G = 2.67$) is 5m thick. The head of water (m) required for the quick condition is :

(A) 5.0 (B) 11

(C) 1.0 (D) 8.1

100. Three cables are joined at the junction ring C. The ratio of tension in cables BC to cable AC is :



(A) 1.5 (B) 2.22

(C) 1.78 (D) 1.22