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Test Booklet Series

Serial No. **669**

A

SCREENING TEST – 2006

SUBJECT : CIVIL ENGINEERING

Time Allowed : ***Two Hours***

Maximum Marks : ***120***

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.

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4. This Booklet contains **120** items (questions). Each item comprises four response (answers). You will select one response which you want to mark on the Respons Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.

5. You have to mark all your responses ***ONLY*** on the separate Response Sheet provided. See directions in the Response Sheet.

6. All items carry equal marks. Attempt *ALL* items. Your total marks will depend only on the number of correct responses marked by you in the Response Sheet.

7. Before you proceed to mark in the Response Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Response Sheet as per instructions sent to you with your Admit Card and Instructions.

8. While writing Centre, Subject, and Roll No. on the top of the Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN"**.

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Screening Test – 2006

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1. The Magnitude of two forces which when acting at right angles produce resultant force of 10 unit and when acting at 30° produce resultant of $\sqrt{183}$ unit. These forces are

(a) 3 and 4

(b) 4 and 6

(c) 6 and 8

(d) 5 and $\sqrt{75}$

2. A particle is moving in Simple Harmonic Motion in a simple pendulum with some period of oscillation. Now in order to double the period of oscillation

(a) The mass of the bob should be doubled

(b) The mass of the bob should be halved

(c) The length of the pendulum should be doubled

(d) The length of the pendulum should be quadrupled

3. A ball weighing 250 gm is thrown vertically upwards with a velocity of 980 cm/sec. The time that the ball will take to return to earth would be

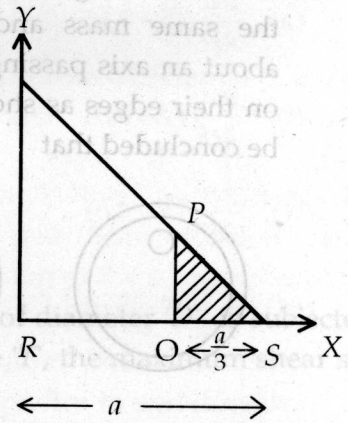
(a) 1 sec

(b) 2 sec

(c) 3 sec

(d) 4 sec

4. From the right angled isosceles triangle QRS of side QR = RS = a, the smaller triangle POS of side PO = OS = $a/3$ is cut out. The centroid of the resultant area will be



(a) $x_c = a/3,\ y_c = a/3$

(b) $x_c = \frac{5}{18}a,\ y_c = \frac{13}{36}a$

(c) $x_c = \frac{5}{36}a,\ y_c = \frac{5}{18}a$

(d) $x_c = \frac{13}{36}a,\ y_c = \frac{5}{18}a$

5. The polar moment of inertia of an equilateral triangle of side 'a' is given by

(a) $\frac{a^4}{64}$

(b) $\frac{a^4}{8}$

(c) $\frac{a^4}{16\sqrt{3}}$

(d) $\frac{a^4}{16}$

6. A roller-coaster reaches a velocity of 20m/sec at location where the radius of curvature is 40m. Calculate the acceleration in m/sec^2

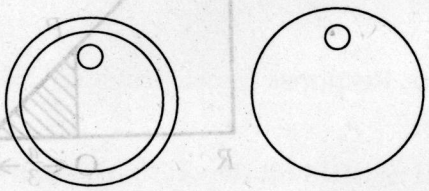
(a) 8

(b) 9

(c) 10

(d) 11

7. A metallic ring and a metallic disc of the same mass and radius oscillate about an axis passing through a point on their edges as shown below. It can be concluded that



(a) The ring will have a larger time period

(b) The disc will have a larger time period

(c) The ring and disc will have same time period

(d) None of the above

8. A solid cylinder of mass 'm' and radius 'r' rolls down an inclined plane without slipping. The acceleration of the centre of mass of rolling cylinder is

(a) $2\,g \sin\theta/3$

(b) $g \sin\theta/4$

(c) $2\,g \cos\theta/3$

(d) $g \cos\theta/4$

9. When coefficient of restitution (e) is zero, the bodies are

(a) Perfectly elastic

(b) Elastic to some extent

(c) Inelastic

(d) None of the above

10. Minimum coefficient of friction between the sphere and a plane inclined at an angle 'θ' to the horizontal so that sphere may roll without slipping is equal to

(a) $\frac{2}{7}\sin\theta$

(b) $\frac{3}{7}\tan\theta$

(c) $\frac{4}{7}\tan\theta$

(d) $\frac{2}{7}\tan\theta$

11. Elongation of a circular rod of length 'l' having tapering diameter d_1 and d_2 at ends, subjected to load 'P' is given by

(a) $\frac{Pl}{\pi E d_1 d_2}$

(b) $\frac{2Pl}{\pi E d_1 d_2}$

(c) $\frac{3Pl}{\pi E d_1 d_2}$

(d) $\frac{4Pl}{\pi E d_1 d_2}$

12. A simply supported beam of length 'l' carrying a load whose intensity varies uniformly from zero at each end to 'w' per unit run at the midspan. The maximum bending moment is

(a) $\frac{wl^2}{10}$

(b) $\frac{wl^2}{9}$

(c) $\frac{wl^2}{12}$

(d) $\frac{wl^2}{15}$

13. A beam of overall length 'l' is supported on two simple supports with equal overhangs on both sides. The beam carries uniformly distributed load. The length of overhang so that the maximum bending moment is minimum, is

(a) 0.152 l

(b) 0.207 l

(c) 0.252 l

(d) 0.307 l

14. The ratio of maximum shear stress and average shear stress in a circular section is

(a) $3/4$

(b) $3/5$

(c) $4/3$

(d) $5/3$

15. The ratio of the deflection at the free end of a cantilever when it is subjected to a concentrated load at the free end and when a concentrated load is applied at the midspan is

(a) $\frac{16}{5}$

(b) $\frac{13}{5}$

(c) $\frac{18}{5}$

(d) $\frac{17}{5}$

16. A shaft of diameter 'D' is subjected to a torque 'T', the maximum shear stress is

(a) $\frac{32\,T}{\pi D^4}$

(b) $\frac{16\,T}{\pi D^3}$

(c) $\frac{32\,T}{\pi D^3}$

(d) $\frac{16\,T}{\pi D^4}$

17. A simply supported beam of length 'l' carries a uniformly distributed load 'w', the strain energy stored in the beam is

(a) $\frac{w^2 l^4}{120EI}$

(b) $\frac{w^2 l^2}{120\,EI}$

(c) $\frac{w^2 l^3}{240\,EI}$

(d) $\frac{w^2 l^5}{240\,EI}$

18. A thin cylindrical shell of diameter 'd', wall thickness 't' is subjected to an internal fluid pressure 'p'. If 'E' is the modulus of elasticity and 'μ' is the Poisson's ratio of the material, the volumetric strain of the cylinder is given by

(a) $\frac{p.d}{4tE}(5-4\mu)$

(b) $\frac{p.d}{4tE}(4-5\mu)$

(c) $\frac{p.d}{2tE}(5-4\mu)$

(d) $\frac{p.d}{2tE}(4-5\mu)$

19. The maximum ordinate under the crown hinge of influence line diagram for the horizontal thrust of three hinged arch is equal to

(a) $L/4h$

(b) $L/8h$

(c) $L/2h$

(d) $L/6h$

Where 'L' is span of the arch and 'h' is the height of the crown hinge.

20. A parabolic two hinged arch is loaded with a concentrated load 'W' at the crown. The horizontal thrust is equal to

(a) $\frac{54}{128}\frac{WL}{h}$

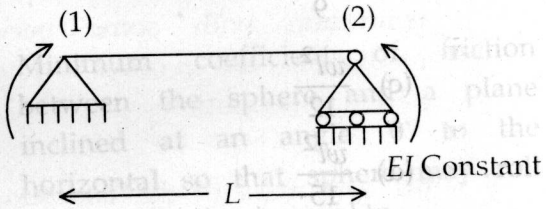
(b) $\frac{25}{128}\frac{WL}{h}$

(c) $\frac{50}{128}\frac{WL}{h}$

(d) $\frac{36}{128}\frac{WL}{h}$

Where 'L' is the span and 'h' is the rise.

21. The flexibility matrix for the simply supported beam with reference to the coordinates, as shown below, is



(a) $\frac{L}{6EI}\begin{bmatrix}2 & 1\\ 1 & 2\end{bmatrix}$

(b) $\frac{L}{3EI}\begin{bmatrix}2 & 1\\ 1 & 2\end{bmatrix}$

(c) $\frac{L}{6EI}\begin{bmatrix}1 & 2\\ 2 & 1\end{bmatrix}$

(d) $\frac{L}{3EI}\begin{bmatrix}1 & 2\\ 2 & 1\end{bmatrix}$

22. When a uniformly distributed load shorter than the span of the girder moves from left to right, then the condition for maximum bending moment at a section is that

(a) The tail of the load is at the left end of the girder

(b) The head of the load is at the right end of the girder

(c) The load position is such that the section divides the load in the same ratio as it divides the span

(d) None of the above

23. A propped cantilever with hinged prop is indeterminate externally to

(a) third degree

(b) second degree

(c) first degree

(d) fourth degree

24. The total strain energy of a member on account of axial force (S) is

(a) $\int \frac{S\,dx}{2AE}$

(b) $\int \frac{S^2\,dx}{2EI}$

(c) $\int \frac{S^2\,dx}{AE}$

(d) $\int \frac{S^2\,dx}{2AE}$

25. The ratio of shear modulus to the modulus of elasticity when Poisson's ratio is 0.25, will be

(a) 0.4

(b) 1.4

(c) 2

(d) 4

26. The effective length of a column effectively held in position and restrained in direction at both ends will be

(a) L

(b) 1.5 L

(c) 2 L

(d) 0.85 L

27. A short column of external diameter D and internal diameter 'd' carries an eccentric load W. The greatest eccentricity which the load can have without producing tension on the cross section of the column, would be

(a) $\frac{D^2 + d^2}{8d}$

(b) $\frac{D + d}{8}$

(c) $\frac{D^2 + d^2}{8}$

(d) $\frac{D^2 + d^2}{8D}$

28. For a beam of length L fixed at one end, simply supported at the other end loaded W at the centre, the maximum bending moment will occur at

(a) Fixed end

(b) Centre

(c) Simply Supported end

(d) Between fixed end and centre

29. Rankine Gordon formula for permissible stress in axial compression is (f = crushing stress at failure, a = constant)

(a) $f_c = \dfrac{f^2}{1+(l/r)^2}$

(b) $f_c = \dfrac{f}{f+(l/r)^2}$

(c) $f_c = \dfrac{f}{1+a(l/r)^2}$

(d) $f_c = \dfrac{f}{1+(l/r)}$

30. For a column of length 'L', hinged at both ends, if the flexural rigidity is EI, then the critical load Pcr is given by

(a) $\dfrac{\pi^2 EI}{L}$

(b) $\dfrac{\pi^2 EI}{L^2}$

(c) $\dfrac{\pi^2 EI}{L^3}$

(d) $\dfrac{\pi^2 EI^2}{L^2}$

31. A column is hinged at both ends, and the critical load is W. Now if one end of this column is made fixed and the other made free, then the critical load will be

(a) W

(b) $2W$

(c) $W/2$

(d) $W/4$

32. Stoke's law in sedimentation analysis is applicable only if the size of the particle is

(a) less than 0.0002 mm

(b) more than 0.002 mm

(c) between 0.2 mm and 0.0002 mm

(d) less than 0.0003 mm

33. According to Atterberg limits, the soil is said to be of medium plasticity, when the plasticity index is

(a) $2 < PI < 7$

(b) $7 \le PI \le 17$

(c) $PI \ge 17$

(d) $PI \le 7$

34. The critical hydraulic gradient of a soil is given by

(a) $\dfrac{G-1}{1+e}$

(b) $\dfrac{G+1}{1+e}$

(c) $\dfrac{G+1}{1+2e}$

(d) $\dfrac{G+1}{1-e}$

35. The Boussinesq influence factor for determining the intensity of vertical pressure directly below the point load on its axis of loading is

(a) 0.333

(b) 0.4775

(c) 0.5

(d) 0.62

36. According to Skempton, compression Index for a remoulded sample is

(a) $0.007\ (WL - 10\%)$

(b) $0.07\ (WL - 10\%)$

(c) $0.7\ (WL - 10\%)$

(d) $0.007\ (10\% - WL)$

Where 'WL' is the liquid limit.

37. The critical height of an unsupported vertical cut in a cohesive soil is given by

(a) $\frac{4c}{w}\tan(45^\circ + \phi/2)$

(b) $\frac{4c}{w}\tan(45^\circ - \phi/2)$

(c) $\frac{2c}{w}\tan(45^\circ + \phi/2)$

(d) $\frac{2c}{w}\tan(45^\circ - \phi/2)$

Where 'c' is cohesion, 'ϕ' is angle of internal friction and 'w' is unit weight of soil.

38. Taylor's stability number is equal to

(a) $\frac{c}{wH_c}$

(b) $\frac{2c}{wH_c}$

(c) $\frac{c}{H_c}$

(d) $\frac{c}{2wH_c}$

Where 'c' is cohesion and H_c is critical height 'w' is unit weight of soil.

39. As per Rankine's formula, the minimum depth of foundation in cohesionless soil is equal to

(a) $\frac{q}{w}\left(\frac{1+\sin\theta}{1-\sin\theta}\right)^2$

(b) $\frac{q}{w}\left(\frac{1-\sin\theta}{1+\sin\theta}\right)^2$

(c) $\frac{q}{w}\left(\frac{1-\sin\theta}{1+\sin\theta}\right)$

(d) $\frac{q}{w}\left(\frac{1+\sin\theta}{1-\sin\theta}\right)$

Where q = safe bearing capacity,

θ = angle of internal friction

w = unit weight of soil

40. The maximum differential settlement in isolated footings on clayey soils should not exceed

(a) 70 mm

(b) 60 mm

(c) 40 mm

(d) 20 mm

41. The area of cross section of a clay specimen of initial volume 'V' and length 'L' in unconfined compression test is

(a) $\frac{V+\Delta V}{L+\Delta L}$

(b) $\frac{V}{L+\Delta L}$

(c) $\frac{V-\Delta V}{L-\Delta L}$

(d) $\frac{V}{L-\Delta L}$

42. Permeability of soil varies

(a) inversely as square of grain size

(b) inversely as grain size

(c) as grain size

(d) as square of grain size

43. A retaining wall is 10 m high and the soil retained has $\phi = 35°$ and unit weight 19 kN/m^3 .Using Rankine's theory, the total active thrust will be

(a) 257 kN

(b) 217 kN

(c) 157 kN

(d) 111 kN

44. Toughness index is

(a) $\frac{\text{Plasticity index}}{\text{Consistency index}}$

(b) $\frac{\text{Liquidity index}}{\text{Flow index}}$

(c) $\frac{\text{Plasticity index}}{\text{Flow index}}$

(d) $\frac{\text{Consistency index}}{\text{Liquidity index}}$

45. The height of capillary rise in soil whose D_{10} is 0.1 mm and void ratio is 0.60, will be

(a) 9 cm

(b) 18 cm

(c) 36 cm

(d) 72 cm

46. What is the maximum size of plate for plate load test

(a) 30 cm square

(b) 45 cm square

(c) 60 cm square

(d) 75 cm square

47. For an irrotational flow the equation $\frac{\partial^2\phi}{\partial x^2}+\frac{\partial^2\phi}{\partial y^2}=0$, is known as

(a) Bernoulli's equation

(b) Reynold's equation

(c) Euler's equation

(d) Laplace equation

48. The Reynold's number may be defined as the ratio of

(a) viscous forces to inertial forces

(b) elastic forces to pressure forces

(c) gravity forces to inertial forces

(d) none of the above

49. The critical condition in a channel is given by

(a) $D = \frac{v^2}{g}$

(b) $D = \frac{v^2}{2g}$

(c) $D = \frac{v}{2g}$

(d) $D = \frac{v}{g}$

50. An object having 20 kg mass weighs 19.6 N on a spring type balance. The value of 'g' in m/sec^2 for the place is

(a) 9.9

(b) 9.8

(c) 10.10

(d) 10.20

51. A liquid compressed in a cylinder has a volume of 1 litre at $1\ MN/m^2$ and a volume of 995 c.c. at $2\ MN/m^2$. The bulk modulus of elasticity would be

(a) 200 MPa

(b) 100 MPa

(c) 20 MPa

(d) 10 MPa

52. The relation between the hydraulic radius 'R' and the depth of water 'D' for the most economical trapezoidal channel is

(a) $R = D$

(b) $R = D/3$

(c) $R = D/2$

(d) $R = \frac{2D}{3}$

53. Bernoulli's theorem deals with the principles of

(a) Momentum

(b) Energy

(c) Mass

(d) Force

54. The discharge through a totally submerged orifice is directly proportional to (Difference in liquid levels on two sides of orifice = H)

(a) H

(b) $H^{-\frac{1}{2}}$

(c) $H^{\frac{3}{2}}$

(d) $H^{\frac{1}{2}}$

55. V_1 and V_2 are the velocities of flow before and after sudden enlargement in a pipe. The loss of head as given by Borda equation would be

(a) $\frac{V_1^2 - V_2^2}{2g}$

(b) $\frac{V_1^2 - V_2^2}{g}$

(c) $\frac{V_2^2 - V_1^2}{2g}$

(d) $\frac{V_2^2 - V_1^2}{g}$

56. The discharge through a V-notch weir varies as

(a) H

(b) $H^{1/2}$

(c) $H^{3/2}$

(d) $H^{5/2}$

Where, H is the head at crest.

57. Manning's formula is used to determine

(a) Friction head loss in pipes running full

(b) discharge through weirs & notches

(c) friction head loss in open channels

(d) friction head loss in irregular sections

58. Which of the following could be a π (Pi) parameters of the function F (V, D, ρ, μ, C, H) = 0, when V, D and ρ are taken as repeating variables

(a) $\frac{gDV}{\rho}$

(b) $\frac{\mu}{\rho DV}$

(c) $\frac{gD}{V}$

(d) $\frac{V^2}{gD}$

59. The statement "For laminar flow through a fine porous bed or capillary passages in a solid, the velocity based on the total cross-section is proportional to the ratio of pressure gradient to viscosity" is known as

(a) Reynold's hypothesis

(b) Schmidt's law

(c) Stoke's law

(d) Darcey's law of permeability

60. In laminar flow

(a) Newton's law of viscosity applies

(b) the fluid particles move in irregular and haphazard paths

(c) the viscosity is unimportant

(d) None of the above

61. Mach number is the ratio of

(a) $\frac{\text{Inertial forces}}{\text{Viscous forces}}$

(b) $\frac{\text{Inertial forces}}{\text{Elastic forces}}$

(c) $\frac{\text{Gravitational forces}}{\text{Viscous forces}}$

(d) $\frac{\text{Inertial forces}}{\text{Gravitational forces}}$

62. In an open channel, the discharge corresponding to critical depth is

(a) minimum

(b) maximum

(c) zero

(d) average

63. When a fluid flows through a tapering pipe at a constantly increasing rate, the flow is said to be

(a) Turbulent flow

(b) Unsteady uniform flow

(c) Unsteady non-uniform flow

(d) Irrotational flow

64. Euler equation of motion can be integrated when it is assumed that

(a) the fluid is compressible

(b) continuity equation is satisfied

(c) the flow is rotational

(d) velocity potential exists and the density is constant

65. Hydraulic jump occurs when

(a) flow is subcritical

(b) flow is supercritical and adequate downstream depth is available

(c) flow is rotational

(d) none of the above

66. The distance from pipe boundary at which the point velocity is equal to average velocity in case of turbulent flow is (when R = radius of pipe)

(a) 0.111 R

(b) 0.223 R

(c) 0.446 R

(d) 0.892 R

67. The ratio of average velocity to maximum velocity for steady laminar flow in circular pipes is

(a) 1

(b) 2

(c) 1/2

(d) 2/3

68. For a flow between two stationary parallel plates, the velocity distribution is parabolic. In this case the mean velocity is equal to

(a) maximum velocity

(b) half the maximum velocity

(c) one-third of the maximum velocity

(d) two-third of the maximum velocity

69. The relationship between Chezy's coefficient 'C' and Manning's coefficient 'n' is

(a) $n = \frac{R^{\frac{1}{6}}}{C}$

(b) $n = R^{\frac{1}{6}}.C$

(c) $n = \frac{R^{\frac{1}{5}}}{C}$

(d) $n = \frac{R^{\frac{1}{6}}}{C^{\frac{1}{2}}}$

70. The section factor 'z' for a critical flow is given by

(a) $\frac{Q}{g}$

(b) $\frac{Q}{g^{\frac{1}{2}}}$

(c) $\frac{Q}{g^{\frac{1}{3}}}$

(d) $\frac{Q}{g^{\frac{2}{3}}}$

Where Q is the discharge through the channel.

71. The friction factor 'f' for turbulent flow in hydrodynamically smooth pipe is

(a) $\frac{0.316}{R^{\frac{1}{3}}}$

(b) $\frac{0.316}{R^{\frac{1}{4}}}$

(c) $\frac{0.316}{R^{\frac{1}{2}}}$

(d) $\frac{0.316}{R^{\frac{2}{3}}}$

72. Analysis of a surge in open channels is done by using

(i) continuity equation

(ii) energy equation

(iii) momentum equation

The correct answer is

(a) both (i) and (ii)

(b) both (ii) and (iii)

(c) both (i) and (iii)

(d) (i), (ii) and (iii)

73. The length of a Guntur's chain is

(a) 50 m

(b) 38 m

(c) 100 ft

(d) 66 ft

74. The total number of links provided in a Guntur's chain is

(a) 100

(b) 50

(c) 66

(d) 33

75. The overall length of a 20 m chain when measured at 8 kg pull and checked against a steel tape standardised at 20°C shall be within

(a) ± 0.05 mm

(b) ± 0. 5 mm

(c) ± 5 mm

(d) ± 5 cm

76. The length of a line measured with a 20 m chain was found to be 250 meters. If the chain was 10 cm too long the true length of the line will be

(a) 248.75 m

(b) 251.25 m

(c) 259.345 m

(d) None of the above

77. If the difference in elevation 'h' between the two ends of the line of inclined length 'L' is measured , the slope correction would be

(a) h/L

(b) $h/2L$

(c) $2h/L$

(d) $h^2/2L$

78. If 'W' is the weight of the chain, 'L' is the span and 'P' is the tension, the sag correction for a chain line would be

(a) $\frac{W^2L^2}{24P^2}$

(b) $\frac{W^2L}{24P^2}$

(c) $\frac{WL}{24P}$

(d) $\frac{WL}{24P^2}$

79. If the whole circle bearing of a place is 170° 12', the quadrantal bearing would be

(a) N 9° 48' E

(b) S 9° 48' E

(c) S 80° 12' E

(d) W 9° 48' S

80. If the fore bearing of a line AB is observed to be 12° 24', the back bearing of the line AB should be

(a) 192° 24'

(b) 102° 24'

(c) 77° 36'

(d) 167° 36'

81. According to Bowditch Rule, the correction to latitude (or departure) of any side is equal to

(a) $\dfrac{\text{length of the side}}{\text{perimeter of traverse}}$

(b) $\dfrac{\text{perimeter of traverse}}{\text{length of the side}}$

(c) total error in latitude $\times$ $\dfrac{\text{length of that side}}{\text{perimeter of traverse}}$

(d) none of the above

82. If k is the distance in kilometers, then the error in mm for precise levelling for bench marks of widely distributed point is

(a) $\pm 4\sqrt{k}$

(b) $\pm 24\sqrt{k}$

(c) $\pm 50\sqrt{k}$

(d) $\pm 100\sqrt{k}$

83. The instrument which is used in plane tabling for obtaining horizontal and vertical distances directly without resorting, known as

(a) Alidade

(b) Clinometer

(c) Telescope-alidade

(d) None of the above

84. The prismoidal formula for volume is

(a) $V = d(A_1 + A_2 + \ldots\ldots\ldots + A_n)$

(b) $V = \dfrac{d}{2}(A_1 + A_2 + \ldots\ldots + A_n)$

(c) $V = \dfrac{d}{2}\left[\dfrac{A_1 + A_n}{2} + A_2 + A_3 + \ldots\ldots A_{n-1}\right]$

(d) $V = \dfrac{d}{3}[(A_1 + A_n) + 4(A_2 + A_4 + \ldots\ldots + A_{n-1}) + 2(A_3 + A_5 + \ldots\ldots + A_{n-2})]$

85. In stadia method, when 'k' is the multiplying factor, 's' is the staff intercept and 'c' is the additive constant of instrument, the distance equation may be written as

(a) $D = k + c\,s$

(b) $D = \dfrac{k}{s} + c$

(c) $D = k\,c + s$

(d) $D = k\,s + c$

86. The interval of 24 h 50.5 m between two successive transits of moon over a meridian is called

(a) Tidal frequency

(b) Tidal amplitude

(c) Tide interval

(d) Tidal day

87. The effect of curvature of earth is to make the objects appear

(a) Higher than they really are

(b) Lower than they really are

(c) Shifted towards right

(d) Shifted towards left

88. In case of heavenly bodies, the angle between the observer's meridian and the vertical circle passing through the body is known as

(a) Azimuth

(b) Declination

(c) Celestial longitude

(d) Celestial altitude

89. Abney's level is useful for all of the following except

(a) tracing grade contours

(b) measuring vertical angles

(c) measuring dip

(d) taking cross sectional levels in hilly ground

90. The international date line is located along

(a) equator

(b) 90° longitude

(c) Greenwich meridian

(d) 180° longitude

91. While measuring the length of a line, the error due to sag will be

(a) cumulative and negative

(b) cumulative and positive

(c) compensating and negative

(d) compensating and positive

92. If in a pin jointed plane frame $(3m + r) > 3j$, then the frame is

(a) unstable

(b) stable and statically indeterminate

(c) stable and determinate

(d) none of the above

Where 'm' is number of members, 'r' is reaction components and 'j' is number of joints.

93. Two bars of length 'L' made of same material are subjected to equal amount of tensile force 'P'. The first bar has a diameter 'd' for a length $l/3$ and '$2d$' for the remaining length, and the second bar has a uniform diameter of $2d$. The ratio of strain energy of the two bars is

(a) 3

(b) 1.5

(c) 4

(d) 2

94. Two rods made of different material are of same size and are also subjected to same amount of tensile force. The ratio of elongation of the rods is 5/6, then the ratio of modulus of elasticity of two rods is

(a) 7/5

(b) 9/5

(c) 6/5

(d) 4/5

95. The shape of a three hinged arch carrying a uniformly distributed load over its entire length, is free from shear force and bending moment is

(a) circular

(b) parabolic

(c) elliptical

(d) none of the above

96. The bulk modulus K in terms of modulus of elasticity E and Poisson's ratio μ is given as equal to

(a) $\frac{E}{(\mu+1)}$

(b) $E(1+2\mu)$

(c) $\frac{E}{3(1-2\mu)}$

(d) $\frac{E}{3(1+2\mu)}$

97. At a certain point in a structural member, the value of $\sigma_x = -45\ N/mm^2$, $\sigma_y = 75\ N/mm^2$ and $\tau = 45\ N/mm^2$. The principal stresses will be

(a) $120\ N/mm^2$ and $30\ N/mm^2$

(b) $120\ N/mm^2$ and $-30\ N/mm^2$

(c) $90\ N/mm^2$ and $60\ N/mm^2$

(d) $90\ N/mm^2$ and $-60\ N/mm^2$

98. When the plastic limit of soil is more than the liquid limit, then the plasticity index is

(a) zero

(b) negative

(c) one

(d) none of the above

99. Rise of water table in cohesionless soil up to ground surface reduces the net ultimate bearing capacity approximately by

(a) 20%

(b) 50%

(c) 60%

(d) 80%

100. The angle between two planes when shear stress is zero, is

(a) 90°

(b) 45°

(c) 75°

(d) 60°

101. When the Reynold's number is less than 500 the flow is said to be laminar for

(a) pipe flow

(b) flow between parallel plates

(c) free surface flow

(d) all of the above

102. The ratio between inertia forces and the square root of pressure forces is known as

(a) Euler number

(b) Weber number

(c) Froude number

(d) Mach number

103. A hydraulic jump is classified on the basis of

(a) Weber number

(b) Mach number

(c) Froude number

(d) Reynolds number

104. Which of the following is the graphical method for the determination of lateral earth pressure

(a) Taylor's method

(b) Mohr's diagram method

(c) Newmark's influence chart method

(d) Culmann's method

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

(a) Montmorillonite

(b) Kallinite

(c) Illite

(d) Halloysite

106. The Phreatic line in case of an earth dam may follow

(a) elliptical path

(b) parabolic path

(c) hyperbolic path

(d) circular path

107. The Bowditch method of adjusting a traverse is based on the assumption that

(a) $e_1 \propto \sqrt{L}$ and $e_2 \propto \frac{1}{\sqrt{L}}$

(b) $e_1 \propto \sqrt{L}$ and $e_2 \propto \sqrt{L}$

(c) $e_1 \propto \frac{1}{\sqrt{L}}$ and $e_2 \propto \sqrt{L}$

(d) $e_1 \propto \frac{1}{\sqrt{L}}$ and $e_2 \propto \frac{1}{\sqrt{L}}$

Where e_1 and e_2 are errors in linear and angular measurements respectively and L is the length of a line.

108. The length of the tangent of a curve of radius 'R' and the angle of deflection Δ is given by

(a) $R \cos \Delta/2$

(b) $R \sin \Delta/2$

(c) $R \tan \Delta/2$

(d) $R \cot \Delta/2$

109. For a beam of length'L' fixed at ends A & B, the maximum bending moment for uniformly distributed load 'W' per unit length will be

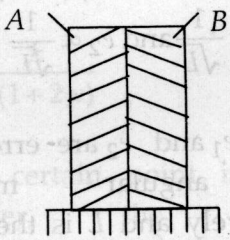
(a) $\frac{WL^2}{4}$

(b) $\frac{WL^2}{12}$

(c) $\frac{WL^2}{8}$

(d) $\frac{WL^2}{24}$

110. A composite member shown below was formed at 20°C and was made of two materials A & B. If the coefficient of thermal expansion of A is more than that of B and the composite member is heated to 140°C, then



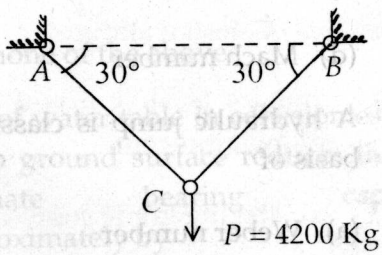
(a) A will be in tension and B in compression

(b) Both A and B will be in compression

(c) A will be in compression and B in tension

(d) Both A & B will be in tension

111. A vertical load P = 4200 kg is supported by two inclined steel wires AC and BC as shown below. If the allowable working stress in tension is 700 kg/ cm^2, the cross sectional area of each wire should not be less than



(a) 1.5 sq.cm

(b) 3.0 sq.cm

(c) 4.5 sq.cm

(d) 6.0 sq.cm

112. The centre of gravity of semicircular lamina of radius 'r' lies on the central radius at a distance of

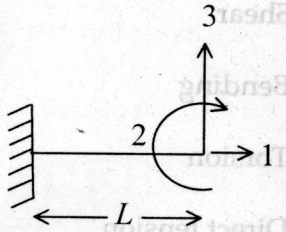
(a) $\frac{r}{2\pi}$ from the base diameter

(b) $\frac{2r}{3\pi}$ from the base diameter

(c) $\frac{3r}{4\pi}$ from the base diameter

(d) $\frac{3r}{8}$ from the base diameter

113. The stiffness matrix for the cantilever beam with reference to the co-ordinates as shown below is



(a) $\begin{bmatrix} \frac{AE}{L} & \frac{4EI}{L} & 0 \\ 0 & 0 & 0 \\ 0 & \frac{6EI}{L^2} & \frac{4EI}{L} \end{bmatrix}$

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

(c) $\begin{bmatrix} \frac{AE}{L} & \frac{4EI}{L} & \frac{6EI}{L^2} \\ 0 & 0 & 0 \\ 0 & \frac{6EI}{L^2} & \frac{12EI}{L^3} \end{bmatrix}$

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

114. The degree of static indeterminacy up to which column analogy method is applicable, is

(a) 1

(b) 2

(c) 3

(d) 4

115. Slope deflection method of structural analysis is

(i) displacement method of structural analysis

(ii) a method in which the joints rotate as a whole and the angles between the tangents to the elastic curve meeting at the joint do not change due to deformation

(iii) a method in which the rotations of the joints are treated as unknown.

The correct answer is

(a) only (i)

(b) both (i) and (ii)

(c) both (i) and (iii)

(d) all (i), (ii) and (iii)

116. Shear force at any section in a conjugate beam gives in the actual beam

(a) deflection

(b) slope

(c) bending moment

(d) none of the above

117. As per Terzaghi's theory, the ultimate bearing capacity at ground surface for a purely cohesive soil for a continuous footing is

(a) 5.7 c

(b) 7.4 c

(c) 3.7 c

(d) 1.3 c

Where c is unit cohesion of soil.

118. Agonic line is a line joining points of

(a) same declination

(b) maximum declination

(c) zero declination

(d) none of the above

119. Cable in a suspension bridge supports load mainly by

(a) Shear

(b) Bending

(c) Torsion

(d) Direct tension

120. A plane on which normal stress is zero is called

(a) Maximum shear plane

(b) Principal plane

(c) Normal plane

(d) None of the above

(For Rough Work)