QUESTION PAPER 2016
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1. The shear modulus (G), modulus of elasticity (E) and the poisson's ratio (μ) of a material are related as

(1) $\mu = \frac{E}{2G}(1 + \mu)$

(2) $\mu = \frac{E}{2G} - 1$

(3) $E = 2G(1 - \mu)$

(4) $E = G(1 - 2\mu)$

2. A solid metal bar of uniform diameter D and length L is hung vertically from a ceiling. If the density of the material of the bar ρ and the modulus of elasticity is E, then the total elongation of the bar due to its own weight is

(1) $\frac{\rho E}{2L^2}$ (2) $\frac{\rho E}{2L}$

(3) $\frac{\rho L^2}{2E}$ (4) $\frac{\rho L}{2E}$

3. A bar of diameter 30 mm is subjected to a tensile load such that the measured extension on a gauge length of 200 mm is 0.09 mm and the change in diameter is 0.0045 mm. The poisson's ratio will be

(1) $\frac{1}{3}$ (2) $\frac{1}{4}$

(3) $\frac{1}{5}$ (4) $\frac{1}{6}$

4. Hook's law is defined as

(1) stress is proportional to strain within elastic limit

(2) stress is proportional to strain within proportionality limit

(3) stress is inversely proportional to strain within elastic limit

(4) stress is inversely proportional to strain within proportionality limit

5. Elastic limit is the point

(1) up to which stress is proportional to strain

(2) at which elongation takes place without application of additional load

(3) up to which if the load is removed, original shape and volume regained

(4) at which the toughness is maximum

6. A bar of length L, uniform cross sectional area A and moment of inertia I is subjected to a pull of P. If young's modulus of elasticity of the bar is E, the expression for strain energy stored in the bar will be

(1) $\frac{P^2L}{2AE}$ (2) $\frac{P^2L}{2EI}$

(3) $\frac{PL^2}{AE}$ (4) $\frac{P^2L}{AE}$

7. The ratio of the stress induced in a bar subjected to suddenly applied load to the stress induced by the same load applied gradually is

(1) 0.5 (2) 1.0

(3) 2.0 (4) 4.0

8. If the shear force diagram of a simply supported beam is parabolic, then the load on the beam is

(1) uniformly distributed load

(2) concentrated load at mid span

(3) external moment acting at mid span

(4) linearly varying distributed load

9. A simply supported beam AB of span L carries two concentrated loads W each at points L/3 from A and B. The shear force in the middle one third portion of the beam is

(1) 2W (2) W

(3) W/2 (4) 0

10. The maximum bending moment in a simply supported beam subjected to external loading occurs

(1) always at mid span

(2) at the point of contraflexure

(3) at the point where shear force changes its sign

(4) at the point where the deflection is maximum

11. A cantilever beam AB of length L is subjected to a uniformly distributed load of w per m run for three fourth of span from the free end. The maximum bending moment at the support is

(1) $\frac{3}{8}wL^2$ (2) $\frac{3}{16}wL^2$

(3) $\frac{9}{32}wL^2$ (4) $\frac{15}{32}wL^2$

12. A simply supported beam of span 6m is subjected to a uniformly distributed load of 24 kN/m over the entire span and a concentrated load of 72 kN at a distance of 2m from the left support. The maximum reaction of support is

(1) 144 kN (2) 120 kN

(3) 108 kN (4) 96 kN

13. The basic assumption of plane sections normal to neutral axis before bending remains plane and normal to the neutral axis after bending, leads to

(1) uniform strain over the beam cross section

(2) uniform stress over the beam cross section

(3) linearly varying strain over the cross section

(4) shear deformations are neglected

14. The section modulus for a solid circular cross section of radius R is

(1) $\frac{\pi R^3}{32}$ (2) $\frac{\pi R^3}{16}$

(3) $\frac{\pi R^3}{8}$ (4) $\frac{\pi R^3}{4}$

15. A symmetrical I section is subjected to a shear force F. The shear stress induced in the section is maximum at
(1) extreme fibre
(2) neutral axis
(3) the bottom of the flange in web portion
(4) the top of the flange in web portion

16. A rectangular beam of width 200 mm and depth 300 mm is subjected to a shear force of 200 kN. The maximum shear stress produced in the beam is
(1) 3.33 N/mm^2
(2) 5.0 N/mm^2
(3) 7.5 N/mm^2
(4) 10.0 N/mm^2

17. The ratio of maximum shear stress to average shear stress in a beam with circular cross section is
(1) $\frac{2}{3}$ (2) $\frac{3}{2}$
(3) $\frac{3}{4}$ (4) $\frac{4}{3}$

18. The shape of the shearing stress distribution across a circular section subjected to transverse loading is
(1) traingle
(2) parabolic only
(3) rectangular only
(4) a combination of rectangular and parabolic shape

19. A shaft transmits 1000 kW of power at 100 rad/sec, then the torque transmitted is
(1) 100 kNm (2) 10 kNm
(3) 1 kNm (4) 0.1 kNm

20. The polar modulus of a circular shaft of diameter D is
(1) $\frac{\pi D^3}{16}$ (2) $\frac{\pi D^3}{32}$
(3) $\frac{\pi D^3}{64}$ (4) $\frac{\pi D^2}{32}$

21. A cantilever beam of span 2L is subjected to a uniformly distributed load of w per m run throughout. The deflection at free end is
(1) $\frac{wL^4}{8EI}$ (2) $\frac{wL^4}{2EI}$
(3) $\frac{wL^4}{EI}$ (4) $\frac{2wL^4}{EI}$

22. A cantilever beam of span L is subjected to a concentrated load of w at midspan. The deflection under the concentrated load is
(1) $\frac{wL^3}{24EI}$ (2) $\frac{wL^3}{8EI}$
(3) $\frac{wL^3}{3EI}$ (4) $\frac{wL^3}{2EI}$

23. The deflection at the midspan of a simply supported beam of span L is subjected to a uniformly distributed load w per m run throughout is
(1) $\frac{5}{768}\frac{wL^4}{EI}$ (2) $\frac{7}{384}\frac{wL^4}{EI}$
(3) $\frac{5}{384}\frac{wL^4}{EI}$ (4) $\frac{1}{48}\frac{wL^4}{EI}$

24. A simply supported beam of span 2L is subjected to a concentrated load of W at midspan. The deflection under the concentrated load is

(1) $\frac{WL^3}{48EI}$ (2) $\frac{WL^3}{16EI}$

(3) $\frac{WL^3}{8EI}$ (4) $\frac{WL^3}{6EI}$

25. The differential equation for deflection

(1) $EI\frac{d^2y}{dx^2} = M$

(2) $EI\frac{dy}{dx} = M$

(3) $EI\frac{d^2y}{dx^2} = F$

(4) $EI\frac{d^2y}{dx^2} + FA\frac{dy}{dx} = M$

26. A uniform beam of span L is rigidly fixed at both end supports A and B. It carries a concentrated load of W at midspan. The bending moment under the load is

(1) $\frac{WL}{4}$ (2) $\frac{WL}{6}$

(3) $\frac{WL}{8}$ (4) $\frac{WL}{12}$

27. A fixed beam of span L is subjected to a uniformly distributed load of w per m run throught. The fixed end moment induced at supports is

(1) $\frac{WL^2}{8}$ (2) $\frac{WL^2}{12}$

(3) $\frac{WL^2}{16}$ (4) $\frac{WL^2}{24}$

28. A propped cantilever AB of span L is fixed at A and propped at B. The beam carries a uniformly distributed load of w per m run over the entire span. The reaction of prop is

(1) $\frac{wL}{2}$ (2) $\frac{3}{8}wL$

(3) $\frac{5}{8}wL$ (4) $\frac{8}{3}wL$

29. A fixed beam AB of span 6 m is rigidly fixed at both supports A and B. It carries a concentrated load of 72 kN at a distance of 2m from support A. The fixed end moment at support A is

(1) 96 kNm (2) 64 kNm

(3) 54 kNm (4) 32 kNm

30. A continous beam ABC is hinged at A and roller supports at B and C. The span AB and BC each equal to L. It is subjected to a uniformly distributed load of w per m run throughout. The reaction of the support B is

(1) $\frac{10}{8}wL$ (2) $\frac{5}{8}wL$

(3) $\frac{3}{8}wL$ (4) $\frac{1}{2}wL$

31. The euler's crippling load for a column of length L and flexural rigidity EI with both ends fixed is

(1) $\frac{\pi^2EI}{4L^2}$ (2) $\frac{\pi^2EI}{L^2}$

(3) $\frac{2\pi^2EI}{L^2}$ (4) $\frac{4\pi^2EI}{L^2}$

32. The effective length of a column of length L fixed against rotation and translation at one end and free at the other end is

(1) 2L (2) 1.414L

(3) 0.707L (4) 0.5L

33. The radius of gyration of a circular column of diameter 400 mm is

(1) 200 mm (2) 100 mm

(3) 50 mm (4) 25 mm

34. If the Euler load for a steel column is 1000kN and crushing load is 1500kN, the rankine load is equal to

(1) 600 kN (2) 1000 kN

(3) 1500 kN (4) 2500 kN

35. A structural member subjected to an axial compressive force is called

(1) beam (2) column

(3) frame (4) truss

36. If ϕ is the angle of repose of soil, the coefficient of active earth pressure is

(1) $\frac{1-\sin^2\phi}{1+\sin^2\phi}$ (2) $\frac{1+\sin^2\phi}{1-\sin^2\phi}$

(3) $\frac{1-\sin\phi}{1+\sin\phi}$ (4) $\frac{1+\sin\phi}{1-\sin\phi}$

37. A retaining wall of base width b and height h is used to retain the earth at its back. For no tension to occur at the heel, the eccentricity e must be

(1) less than b/6

(2) greater than b/6

(3) less than b/3

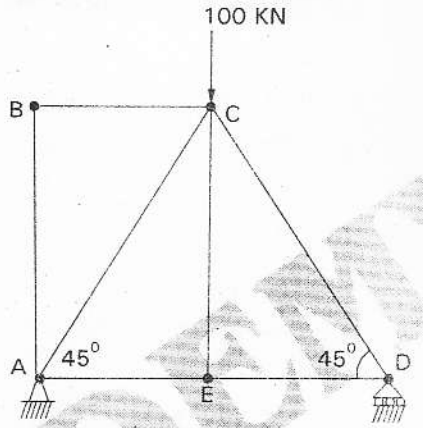
(4) greater than b/3

38. Which of the following relation satisfies for a statically determinate truss with number of members m, number of reaction components r and number of joints j.

(1) $m - r = 2j$ (2) $m + r = 2j$

(3) $m + j = 2r$ (4) $r + j = 2m$

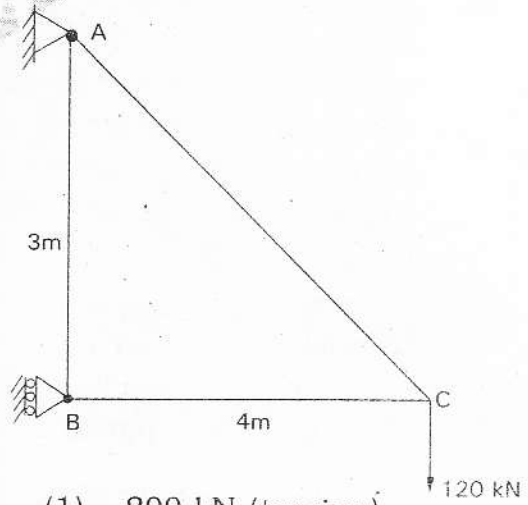
39. The force tin the member CE of the truss shown in figure is



(1) 100 kN (2) 35.5 kN

(3) 25 kN (4) zero

40. The force in the member AC of the truss shown in figure is



(1) 200 kN (tension)

(2) 200 kN (compression)

(3) 150 kN (compression)

(4) 150 kN (tension)

41. The modulus of elasticity of concrete in terms of its characteristic cube compressive strength (f_{ck}) in MPa according to IS:456-2000 is

(1) $5000f_{ck}$ (2) $5000\sqrt{f_{ck}}$

(3) $0.7f_{ck}$ (4) $0.7\sqrt{f_{ck}}$

42. The modular ratio for the concrete of grade M20 to used in the analysis of RC beams using working stress method is

(1) 18.6 (2) 13.3

(3) 9.9 (4) 6.5

43. The total compressive force at the time of failure of a concrete beam section of width b considering the partial safety factor of the material is

(1) $0.8f_{ck}.b.x_u$

(2) $0.66f_{ck}.b.x_u$

(3) $0.54f_{ck}.b.x_u$

(4) $0.36f_{ck}.b.x_u$

44. A reinforced concrete T beam flange under compression having breadth of rib b_w, thickness of flange D_f and the distance between the adjacent zero moment is l_0, then the effective width of flange as per IS:456-2000 is

(1) $\frac{l_0}{3} + b_w + 6D_f$

(2) $\frac{l_0}{6} + b_w + 3D_f$

(3) $\frac{l_0}{6} + 6D_f$

(4) $\frac{l_0}{6} + b_w + 6D_f$

45. The span to depth ratio limit is specified in IS:456-2000 for the reinforced concrete beams, in order to ensure that the

(1) tensile crack width is below a limit

(2) shear failure is avoided

(3) stress in the tension reinforcement is less than the allowable value

(4) deflection of beam is below a limiting value

46. The maximum depth of neutral axis for a beam with effective depth d, in limit state method of design, for Fe 415 grade steel is

(1) 0.53d (2) 0.50d

(3) 0.48d (4) 0.46d

47. Minimum tension steel reinforcement in RC beam needs to be provided to

(1) prevent sudden failure

(2) arrest the crack width

(3) control excessive deflection

(4) prevent surface hair cracks

48. Doubly reinforced beams are recommended when

(1) the breadth of the beam is restricted

(2) the depth of the beam is restricted

(3) both breadth and depth are restricted

(4) the shear force is high.

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60. A RCC roof slab is called as a two way slab if
    (1) the slab is continous over two opposite edges only
    (2) the slab is un-supported at one edge only
    (3) the ratio of long span to short span is >2
    (4) the ratio of long span to short span is <2

61. The main principle of survey is to
    (1) work from part to whole
    (2) work from whole to part
    (3) work from the centre of the area
    (4) fix positions of new locations by precise instruments

62. The distance between two points were measured with 20m chain as 500m. Afterwards it was seen that the chain was 0.08m too long, what was the correct distance
    (1) 502m (2) 498m
    (3) 512m (4) 488m

63. The horizontal angle between the true meridian and a line is
    (1) azimuth
    (2) declination
    (3) dip
    (4) magnetic bearing

64. Isogonic lines pass through points of
    (1) equal dip
    (2) equal declination
    (3) zero dip
    (4) zero declination

65. If WCB of a line is $287^0 30'$, then its reduced bearing will be
    (1) $N17^0 30'W$ (2) $N72^0 30'W$
    (3) $S72^0 30'E$ (4) $S17^0 30'W$

66. If the magnetic bearing of a line is $S\ 48^0 40'\ E$ and the magnetic declination at that place is $4^0 10'$ E, the true bearing of a line is
    (1) $S52^0 50'E$ (2) $S52^0 50'W$
    (3) $S44^0 30'E$ (4) $S44^0 30'W$

67. The following are the observed bearing of the lines of a traverse ABCDEA with a compass

line	FB	BB
AB	$191^0 45'$	$13^0 0'$
BC	$39^0 30'$	$222^0 30'$
CD	$22^0 15'$	$200^0 30'$
DE	$242^0 45'$	$62^0 45'$
EA	$330^0 15'$	$147^0 45'$

The stations free from local attraction are
    (1) C and D (2) D and E
    (3) E and A (4) C and A

68. The reading on the floor of a verandah of a college building is 1.815 and staff reading when held with bottom of staff touching the ceilling over the verandah is 2.870 m. R.L of the floor is 74.500m. Height of the ceilling above floor is

(1) 4.270m (2) 4.685m

(3) 3.955m (4) 4.920m

69. In case of levelling, back sight is

(1) a fixed point of known elevation

(2) the last staff reading taken before shifting the instrument

(3) the first reading taken after setting the instrument

(4) any staff reading taken on a point of unknown elevation

70. A contour may be defined as an imaginary line passing through

(1) points on the longitudinal section

(2) points of equal elevation

(3) points of equal local ground slope

(4) points of transverse section surveys

71. The size of the theodolite is defined according to the

(1) length of telescope

(2) diameter of graduated horizontal circle

(3) height of standard

(4) vernier plane diameter

72. The latitude and departure of a line AB are +78m and –45.1 m respectively. The whole circle bearing of the line AB is

(1) 30^0

(2) 150^0

(3) 210^0

(4) 330^0

73. The tangential method of tacheometry is

(1) slower than stadia hair method

(2) faster than stadia hair method

(3) preferred as involves less computations to get reduced distances

(4) preferred as chances of operational errors are less compared to stadia hair method

74. Anallactic lens provided in a tacheometer is a

(1) concave lens

(2) convex lens

(3) plano-convex lens

(4) plane lens

75. EDM method is based on generation, propagation, reflection and subsequent reception of

(1) electrons

(2) sound waves

(3) visible light waves

(4) electromagnetic waves

76. A static fluid can have
(1) non-zero normal and shear stress
(2) negative normal stress and zero shear stress
(3) positive normal stress and zero shear stress
(4) zero normal stress and non-zero shear stress

77. A fluid is a said to be newtonian when the
(1) shear stress is proportional to shear strain
(2) rate of shear stress is proportional to shear strain
(3) shear stress is proportional to rate of shear strain
(4) rate of shear stress is proportional to rate of shear strain

78. An isosceles triangular plate of base 3m and altitude 3m is immersed vertically in an oil of specific gravity 0.8. The base of the plate coincides with the free surface of oil. The centre of pressure from free surface will lie at a distance of
(1) 2.5m (2) 2m
(3) 1.5m (4) 1m

79. The absolute pressure at a point 3m below the clear water surface is measured as 125.5 kN/m^2. If the atmospheric pressure is taken as 101 kN/m^2, the gauge pressure in kN/m^2 at this point would be
(1) 24.4 (2) 48.8
(3) 101.0 (4) 226.5

80. Stream lines, path lines and streak lines are virtually identical for
(1) uniform flow
(2) flow of ideal fluids
(3) steady flow
(4) non uniform flow

81. A streamline and an equipotential line in a flow field
(1) are parallel to each other
(2) are perpendicular to each other
(3) intersect at an acute angle
(4) are identical

82. If the error in the measurement of head in a V notch is 1%, then the error in the measurement of discharge will be
(1) 1% (2) 1.5%
(3) 2% (4) 2.5%

83. The bernoulli's equation is applicable to
(1) both steady and unsteady flows
(2) real fluids
(3) all fluids and flows along a stream tube
(4) steady flow of ideal fluid along a stream tube

84. For a hydraulically efficient rectangular channel of bed width 4m, depth of flow is
(1) 0.5m (2) 1m
(3) 2m (4) 4m

85. In log pipes, the major loss of energy is due to

(1) friction

(2) sudden contraction

(3) sudden enlargement

(4) gradual contraction or enlargement

86. The hydraulic grade line is

(1) always above the centre line of pipe

(2) always below the energy grade line

(3) always above the energy grade line

(4) always sloping downward in the direction of flow

87. Two pipes of same length with diameters d and 2d respectively are connected in series. The diameter of an equivalent pipe of same length is

(1) less than d

(2) between d and 1.5d

(3) between 1.5d and 2d

(4) greater than 2d

88. For laminar flow in circular pipes, if R_c is reynolds number then the friction factor is equal to

(1) $\frac{16}{R_e}$ (2) $\frac{32}{R_e}$

(3) $\frac{64}{R_e}$ (4) $\frac{128}{R_e}$

89. The specific speed of a pump is defined as the speed of a unit such that it

(1) delivers unit discharge at unit head

(2) delivers unit discharge at unit power

(3) delivers unit power at unit head

(4) produces unit power at head

90. Which of the following water turbines has high specific speed

(1) reaction turbine

(2) impulse turbine

(3) pelton wheel

(4) propeller turbine

91. An isohyet is a line joining points of

(1) equal temperature

(2) equal humidity

(3) equal rainfall depth

(4) equal evaporation

92. The rainfall hyetograph shows the variation of

(1) cumulative depth of rainfall with time

(2) rainfall depth with area

(3) rainfall intensity with time

(4) rainfall intensity with cumulative depth of rainfall

93. Dicken's formula for computing maximum flood discharge, Q, in terms of the area A and the coefficient, C_D as

(1) $Q = C_D.A^{2/3}$

(2) $Q = C_D.A^{3/4}$

(3) $Q = C_D.A^{1/4}$

(4) $Q = C_D.A^{1/3}$

94. Given that the base period is 100 days and the duty of the canalis 1000 hectares per cumec, the depth of water will be

(1) 0.864 cm

(2) 8.64 cm

(3) 86.4 cm

(4) 864 cm

95. A sprinkler irrigation system is suitable when

(1) the land gradient is steep and the soil is easily erodible

(2) the soil is having low permeability

(3) the water table is low

(4) the crops to be grown have deep roots

96. When the reservoir is full, the maximum compressive force in a gravity dam occurs

(1) at the heel

(2) at the toe

(3) at the centre of the base

(4) within the middle third of the base

97. Seepage through foundation in an earthen dam is controlled by providing

(1) chimney drain

(2) horizontal blanket

(3) impervious cut off

(4) rock toe

98. For medium silt whose average grain size is 0.16mm, Lacey's silt factor is likely to be

(1) 0.30 (2) 0.45

(3) 0.70 (4) 1.32

99. Which of the following is a rigid dam

(1) gravity dam

(2) earth dam

(3) rockfill dam

(4) coffer dam

100. The type of cross drainage work provided when the canal runs below the drain, with FSL of canal well below the bed of the drain is

(1) aqueduct

(2) super passage

(3) level crossing

(4) siphon aqueduct

ANSWERS

1. **(2)**	2. **(3)**	3. **(1)**	4. **(1)**	5. **(3)**	6. **(1)**	7. **(3)**	8. **(4)**	9. **(4)**	10. **(3)**
11. **(4)**	12. **(2)**	13. **(3)**	14. **(4)**	15. **(2)**	16. **(2)**	17. **(4)**	18. **(2)**	19. **(2)**	20. **(1)**
21. **(4)**	22. **(1)**	23. **(3)**	24. **(4)**	25. **(1)**	26. **(3)**	27. **(2)**	28. **(2)**	29. **(2)**	30. **(1)**
31. **(4)**	32. **(1)**	33. **(2)**	34. **(1)**	35. **(2)**	36. **(3)**	37. **(1)**	38. **(2)**	39. **(4)**	40. **(1)**
41. **(2)**	42. **(2)**	43. **(4)**	44. **(4)**	45. **(4)**	46. **(3)**	47. **(1)**	48. **(2)**	49. ( )	50. ( )
51. ( )	52. ( )	53. ( )	54. ( )	55. ( )	56. ( )	57. ( )	58. ( )	59. ( )	60. **(4)**
61. **(2)**	62. **(1)**	63. **(1)**	64. **(2)**	65. **(2)**	66. **(3)**	67. **(2)**	68. **(2)**	69. **(3)**	70. **(2)**
71. **(2)**	72. **(4)**	73. **(1)**	74. **(2)**	75. **(4)**	76. **(3)**	77. **(3)**	78. **(3)**	79. **(1)**	80. **(3)**
81. **(2)**	82. **(4)**	83. **(4)**	84. **(3)**	85. **(1)**	86. **(2)**	87. **(1)**	88. **(3)**	89. **(1)**	90. **(4)**
91. **(3)**	92. **(3)**	93. **(2)**	94. **(3)**	95. **(1)**	96. **(2)**	97. **(3)**	98. **(3)**	99. **(1)**	100. **(2)**