1. If the Young's modulus is 200 GPa and strain is 0·001, then the stress developed is

(A) 100 MPa

(B) 150 MPa

(C) 200 MPa

(D) 250 MPa

2. The principal stresses are 80 MPa and 20 MPa. The maximum shear stress is

(A) 20 MPa

(B) 30 MPa

(C) 40 MPa

(D) 50 MPa

3. A beam fixed at one end and free at the other has length 2 m. The maximum deflection occurs at

(A) mid-span

(B) quarter-span

(C) fixed end

(D) free end

4. A simply supported beam of 8 m carries a point load at the centre. The location of maximum BM is at

(A) support

(B) mid-span

(C) quarter-span

(D) free end

5. Flow is laminar in pipes where the Reynolds' number is

(A) 2000

(B) 3000–4000

(C) > 2000

(D) > 6000

6. The centroid of a semicircular lamina of radius R is located at a distance _____ from the base.

(A) $\frac{R}{2}$

(B) $\frac{2R}{\pi}$

(C) $\frac{4R}{3\pi}$

(D) $\frac{3R}{4}$

7. The dimensional formula of force is

(A) ML^2T^{-2}

(B) MLT^{-1}

(C) MLT^{-2}

(D) $ML^{-1}T^{-2}$

8. A bar of 2 m length elongates by 1 mm under axial load. The longitudinal strain is

(A) 0·00025

(B) 0·0005

(C) 0·001

(D) 0·002

9. For rectilinear motion with constant acceleration, the velocity-time equation is

(A) parabolic

(B) hyperbolic

(C) straight line

(D) sinusoidal

10. Instantaneous centre of rotation is the point where

(A) acceleration is zero

(B) velocity is zero

(C) angular velocity is zero

(D) displacement is zero

11. The bending moment at a point, where the shear force is zero, is

(A) zero

(B) minimum

(C) maximum

(D) constant

12. The flexural formula is

(A) $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$

(B) $\sigma = E\varepsilon$

(C) $\tau = G\gamma$

(D) $M = EI$

13. The principle of virtual work is applicable when a system is

(A) in motion

(B) in static equilibrium

(C) in dynamic equilibrium

(D) under acceleration

14. A soil sample has void ratio of 0·6 and the specific gravity of solids is 2·65. The dry unit weight of the soil (take $\gamma_w = 9{\cdot}81\ kN/m^3$) is

(A) $14{\cdot}80\ kN/m^3$

(B) $15{\cdot}60\ kN/m^3$

(C) $16{\cdot}30\ kN/m^3$

(D) $17{\cdot}20\ kN/m^3$

15. A soil sample has water content = 20% and dry density = 16 kN/m^3. Determine the bulk density.

(A) 18·0 kN/m^3

(B) 19·20 kN/m^3

(C) 20·0 kN/m^3

(D) 21·60 kN/m^3

16. The coefficient of permeability of soil is 2×10^{-4} m/s. If the hydraulic gradient is 0·5, then find the seepage velocity.

(A) 1×10^{-4} m/s

(B) 2×10^{-4} m/s

(C) 4×10^{-4} m/s

(D) 1×10^{-3} m/s

17. The factor of safety of a slope is 1·5. If the driving force = 100 kN, then the resisting force equals

(A) 67 kN

(B) 100 kN

(C) 150 kN

(D) 200 kN

18. The maximum shear stress theory is also known as

(A) Rankine theory

(B) Tresca theory

(C) von Mises theory

(D) Coulomb theory

19. The density of soil = 850 kg/m^3. Find the pressure at 5 m depth.

(A) 31·50 kPa

(B) 41·70 kPa

(C) 55·60 kPa

(D) 83·40 kPa

20. Water flows in a pipe with velocity = 0·8 m/s, diameter = 0·2 m, kinematic viscosity = 1×10^{-6} m^2/s. Determine the Reynolds' number.

(A) 80000

(B) 120000

(C) 160000

(D) 200000

21. The Froude number = 0·6 indicates that the flow is

(A) supercritical

(B) critical

(C) subcritical

(D) turbulent

22. Critical depth occurs when the specific energy is

(A) maximum

(B) zero

(C) minimum

(D) constant

23. For dynamically similar flows, the Reynolds' number must be

(A) zero

(B) constant

(C) minimum

(D) maximum

24. The venturi meter's coefficient of discharge is usually

(A) < 0·5

(B) 0·6–0·7

(C) 0·95–0·99

(D) > 1

25. Hydraulic jump causes loss of

(A) mass

(B) energy

(C) momentum

(D) discharge

26. A uniform ladder of length L and weight W rests against a smooth vertical wall and a rough horizontal floor (coefficient of friction = μ). The ladder makes an angle θ with the floor. Using the principle of virtual work, determine the minimum value of μ for equilibrium.

(A) $\mu_{min} = \frac{1}{2}\cos\theta$

(B) $\mu_{min} = \frac{1}{2}\cot\theta$

(C) $\mu_{min} = \frac{1}{2}\sin\theta$

(D) $\mu_{min} = \frac{1}{2}\text{cosec}\,\theta$

27. Fixed beam has how many reactions?

(A) 2

(B) 3

(C) 4

(D) 6

28. The maximum shear force in simply supported beam with UDL occurs

(A) at the centre

(B) at the supports

(C) at the quarter-span

(D) anywhere

29. The observed bearings of lines AB and BC are given below :

Line	Fore Bearing	Back Bearing
AB	45°30′	225°00′
BC	120°15′	300°45′

Which station(s) is/are affected by local attraction?

(A) A only

(B) B only

(C) B and C

(D) None of the above

30. In a closed traverse, the total length = 600 m, error in latitude = + 0·24 m, length of line AB = 150 m. The correction of latitude of AB is

(A) −0·04 m

(B) −0·06 m

(C) −0·08 m

(D) −0·10 m

31. A saturated clay sample has the following properties :

Specific gravity = 2·7

Void ratio = 0·8

The saturated unit weight (in kN/m^3) of the soil is closest to

(A) 16·90

(B) 18·40

(C) 19·60

(D) 21·20

32. A normally consolidated clay layer of thickness 4 m undergoes consolidation settlement of 48 mm. If the degree of consolidation is 25%, then the settlement at that time is

(A) 6 mm

(B) 12 mm

(C) 18 mm

(D) 24 mm

33. For a clay soil, the unconfined compressive strength is 120 kPa. The undrained shear strength (in kPa) is

(A) 30

(B) 40

(C) 60

(D) 120

34. The velocity of flow in a pipe increases from 2 m/s to 4 m/s. The increase in velocity head (in m) is

(A) 0·31

(B) 0·61

(C) 1·22

(D) 1·84

35. The dimensional formula of impulse is $[M]^a[L]^b[T]^c$. Find $a+b+c$.

(A) 1

(B) 2

(C) 3

(D) 4

36. Two cars A and B move in the same direction at 20 m/s and 12 m/s respectively. The relative velocity (in m/s) of A with respect to B is

(A) 8

(B) 4

(C) 12

(D) 20

37. Terzaghi's theory of consolidation is applicable for

(A) two-dimensional flow

(B) radial consolidation

(C) one-dimensional consolidation

(D) secondary compression

38. A solid cylinder of mass 10 kg and radius 0·2 m rotates about its axis. The moment of inertia (in kg-m^2) is

(A) 0·2

(B) 2

(C) 10

(D) 0·02

39. The discharge through a pipe is 0·04 m^3/s and the diameter is 0·2 m. Find the velocity.

(A) 0·8 m/s

(B) 1·27 m/s

(C) 2·0 m/s

(D) 4·0 m/s

40. The head loss due to friction is directly proportional to

(A) velocity

(B) velocity^2

(C) diameter

(D) pressure

41. A force of 10 N acts on a 2 kg mass. The acceleration produced is

(A) 2 m/s^2

(B) 4 m/s^2

(C) 5 m/s^2

(D) 10 m/s^2

42. If the Young's modulus E = 200 GPa and Poisson's ratio = 0·25, then the shear modulus G (in GPa) is

(A) 100

(B) 200

(C) 80

(D) 40

43. Two forces of 10 kN and 20 kN act at an angle of 60° between them. The magnitude of the resultant is

(A) 26·50 kN

(B) 30·00 kN

(C) 17·30 kN

(D) 15·00 kN

44. Sheet piles are commonly used to

(A) increase bearing capacity

(B) prevent seepage and soil movement

(C) reduce settlement

(D) improve compaction

45. The first stage of water treatment is

(A) sedimentation

(B) filtration

(C) disinfection

(D) coagulation and mixing

46. The pH value of drinking water should be in the range of

(A) 1 to 10

(B) 2 to 6

(C) 6·5 to 8·5

(D) 8·5 to 10

47. Tacheometry is best suited

(A) where chaining is impossible

(B) for populous area

(C) in broken ground

(D) for extremely accurate survey

48. During analysis for pure bending of beam, the beam is assumed to be subjected to

(A) biaxial stress

(B) uniaxial stress

(C) compound stress

(D) complementary shear stress

49. Thixotropy is a quality of soil

(A) to regain compressive strength after vibration

(B) to regain cohesion after kneading

(C) to regain friction after kneading

(D) to allow percolation

50. A Pitot tube is used to measure

(A) velocity of flow

(B) pressure of flow

(C) rate of flow

(D) total energy

51. If the principal stresses are $5\ N/mm^2$ (tension) and $3\ N/mm^2$ (compression), then the maximum shear stress is

(A) $4\ N/mm^2$

(B) $1\ N/mm^2$

(C) $0\ N/mm^2$

(D) None of the above

52. Geodetic surveying considers the earth's surface as

(A) spheroidal

(B) plane

(C) straight

(D) None of the above

53. The difference between undisturbed shear strength and remoulded shear strength is known as

(A) activity

(B) sensitivity

(C) thixotropy

(D) dilatancy

54. Under-reamed piles are generally

(A) driven piles

(B) bored cast in situ piles

(C) precast piles

(D) None of the above

55. If the age of loading on concrete structure is 28 days, then the creep coefficient may be taken as

(A) 2·2

(B) 2

(C) 1·8

(D) 1·6

56. In the primary treatment of sewage, the operation which takes place is

(A) removal of settleable organic solids

(B) removal of floating matter

(C) removal of gravel

(D) removal of oil and grease

57. The superelevation needed on a horizontal circular curve of 150 m radius for a design speed of 60 kmph with a coefficient of friction of 0·15 is

(A) 1·26%

(B) 3·87%

(C) 5·25%

(D) 7·0%

58. The coefficient of discharge C_d of a venturi meter lies within the limits

(A) 0·7–0·9

(B) 0·6–0·8

(C) 0·75–0·95

(D) 0·95–0·99

59. In an open-channel flow, the mean velocity across a cross-section of the channel occurs at

(A) 0·4 depth from free surface

(B) 0·6 depth from free surface

(C) 0·5 depth from free surface

(D) 0·2 depth from free surface

60. Turbidity meter is used to measure

(A) suspended solids

(B) dissolved solids

(C) total dissolved solids

(D) volatile solids

61. The total energy line lies over the hydraulic gradient line by an amount which is equal to

(A) velocity head

(B) pressure head

(C) friction head

(D) datum head

62. Which of the following is not a hydraulic failure of the earth dams?

(A) Toe erosion

(B) Wave erosion

(C) Overtopping

(D) Sloughing

63. The horizontal angle which a line makes with the true meridian through one of the extremities of the line is called

(A) bearing

(B) true bearing

(C) magnetic bearing

(D) imaginary bearing

64. Trickling filters are used to remove

(A) suspended solids

(B) colloidal solids

(C) organic matter

(D) pathogenic bacteria

65. Acid rain is caused by

(A) nitrogen and carbon

(B) sulphur and nitrogen

(C) phosphorus and carbon

(D) sulphur and phosphorus

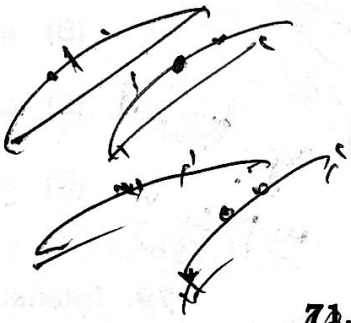
66. Two rolling loads 160 kN and 90 kN, 4 m apart, are moving on a simply supported beam of span 12 m. The absolute maximum shear force will be

(A) 160 kN

(B) 250 kN

(C) 220 kN

(D) 50 kN



67. A suspension bridge with a 2-hinged stiffening girder is statically

(A) determinate

(B) indeterminate to 1 degree

(C) indeterminate to 2 degrees

(D) indeterminate to 3 degrees

68. Phreatic line in an earth dam is

(A) straight line

(B) parabolic

(C) circular

(D) elliptical

69. Westergaard's analysis for stress distribution beneath loaded area is applicable to

(A) sandy soil

(B) clayey soil

(C) stratified soil

(D) silty soil

70. The length of engineer's chain should be

(A) 20 m

(B) 66 ft

(C) 100 ft

(D) 30 m

71. The soil transported by flowing water is called

(A) aeolian soil

(B) alluvial soil

(C) marine soil

(D) lacustrine soil

72. The maximum area of tension reinforcement in a beam shall not exceed

(A) $0{\cdot}02bD$

(B) $0{\cdot}04bD$

(C) $0{\cdot}08bD$

(D) $1{\cdot}0bD$

73. The subsurface water obtained under pressure is generally known as

(A) open well

(B) tube well

(C) artesian well

(D) infiltration well

74. The error in measured length due to sag of chain or tape is known as

(A) positive error

(B) negative error

(C) compensation error

(D) instrumental error

75. A prismatic compass is used to determine

(A) dip at a place

(B) declination of a line

(C) whole circle bearing of a line

(D) quadrantal bearing of a line

76. One cubic meter of mild steel weighs about

(A) 1000 kg

(B) 3625 kg

(C) 7850 kg

(D) 12560 kg

77. The force polygon representation of a set of forces in equilibrium is

(A) open polygon

(B) closed polygon

(C) parallelogram

(D) triangle

78. When the plasticity index of a soil is zero, the soil is

(A) clay

(B) silt

(C) sand

(D) silty sand

79. Intensity of rainfall is

(A) the total rainfall in a period

(B) the rainfall per unit area

(C) the volume of water collected per unit time

(D) the depth of rainfall per unit time during which it fell

80. The stiffness method in structural analysis is also known as

(A) unit load method

(B) force method

(C) displacement method

(D) consistent deformation method

81. The algebraic sum of moments of forces about any point is zero for a body in

(A) dynamic equilibrium

(B) static equilibrium

(C) kinetic equilibrium

(D) neutral equilibrium

82. The void ratio of a soil mass is defined as

(A) the ratio of volume of voids to total volume

(B) the ratio of volume of solids to volume of voids

(C) the ratio of volume of voids to volume of solids

(D) the ratio of water content to dry density

83. Venturi meter works on the principle of

(A) continuity equation

(B) momentum equation

(C) Bernoulli's theorem

(D) Pascal's law

84. Specific energy is minimum at

(A) normal depth

(B) maximum velocity

(C) critical depth

(D) uniform flow

85. Hydraulic jump is an example of

(A) gradually varied flow

(B) uniform flow

(C) rapidly varied flow

(D) laminar flow

86. Bernoulli's equation is based on the conservation of

(A) mass

(B) energy

(C) momentum

(D) angular momentum

87. The factor of safety of a slope is defined as

(A) driving force/resisting force

(B) resisting force/driving force

(C) shear stress/shear strength

(D) normal stress/shear stress

88. In clayey soils, consolidation settlement occurs mainly due to

(A) expulsion of air

(B) compression of solids

(C) expulsion of water

(D) chemical reaction

89. Coulomb's earth pressure theory considers

(A) only wall friction

(B) only soil friction

(C) both wall friction and soil friction

(D) neither wall friction nor soil friction

90. The unit of coefficient of permeability is

(A) m/s

(B) m^2/s

(C) kN/m^2

(D) It is dimensionless

91. The maximum dry density of soil is obtained at

(A) zero air voids

(B) plastic limit

(C) optimum moisture content

(D) shrinkage limit

92. A material having identical properties in all directions is called

(A) homogeneous

(B) isotropic

(C) elastic

(D) ductile

93. Hooke's law is valid up to

(A) yield point

(B) elastic limit

(C) breaking point

(D) proportional limit only

94. Riveted joints are primarily subjected to

(A) bending stress

(B) torsional stress

(C) shear stress

(D) bearing stress only

95. A simply supported beam of span 6 m carries a central point load of 12 kN. The maximum bending moment is

(A) 12 kN-m

(B) 18 kN-m

(C) 24 kN-m

(D) 36 kN-m

96. The angular velocity of a wheel rotating at 300 r.p.m. is

(A) 10π rad/s

(B) 20π rad/s

(C) 5π rad/s

(D) 30π rad/s

97. The momentum of a 5 kg body moving at 6 m/s is

(A) 11 kg-m/s

(B) 30 kg-m/s

(C) 60 kg-m/s

(D) 120 kg-m/s

98. The kinetic energy of a body of mass 4 kg moving at 5 m/s is

(A) 25 J

(B) 40 J

(C) 50 J

(D) 100 J

99. A flywheel has a mass moment of inertia of 10 kg-m^2 and angular velocity of 5 rad/s. The angular momentum is

(A) 2 kg-m^2/s

(B) 10 kg-m^2/s

(C) 25 kg-m^2/s

(D) 50 kg-m^2/s

100. A bar of cross-sectional area 500 mm^2 carries a tensile load of 50 kN. The stress developed is

(A) 50 MPa

(B) 100 MPa

(C) 150 MPa

(D) 200 MPa