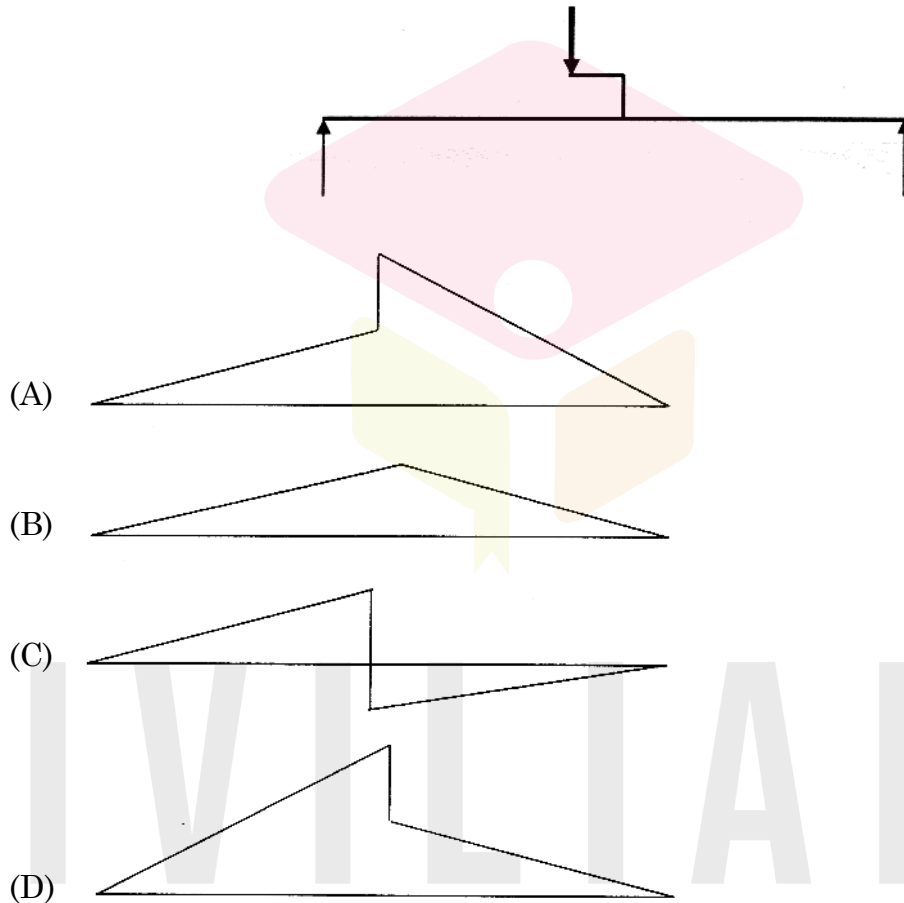


013/2020

Maximum : 100 marks

Time : 1 hour and 15 minutes

1. Select the bending moment diagram for the simply supported beam loaded as shown in the figure :



2. An axially loaded member of length L and area of cross-section A is subjected to a tensile load of P . If E denotes the Young's modulus of elasticity, the strain energy stored in the member is equal to :

- | | |
|-------------------------|------------------------|
| (A) $\frac{P^2 L}{2AE}$ | (B) $\frac{PL^2}{2AE}$ |
| (C) $\frac{P^3 L}{2AE}$ | (D) $\frac{PL}{AE}$ |

3. The product moment of inertia of a rectangular section of size $b \times d$ about its horizontal centroidal axis is equal to :
- (A) $\frac{b^2 d^2}{4}$ (B) $\frac{bd^2}{6}$
 (C) 0 (D) $\frac{b^2 d^2}{6}$
4. If V denotes the shear force acting at a particular section along the span of a beam having a rectangular cross-section of width b and depth h , then the shear stress at the neutral axis is :
- (A) 0 (B) $\frac{3V}{2bh}$
 (C) $\frac{3V}{4bh}$ (D) $\frac{V}{bh}$
5. The two independent elastic constants for an isotropic material are :
- (A) Young's modulus and Poisson's ratio
 (B) Bulk modulus and Young's modulus
 (C) Shear modulus and Poisson's ratio
 (D) Bulk modulus and Poisson's ratio
6. The static indeterminacy of a propped cantilever beam is equal to :
- (A) 3 (B) 2
 (C) 1 (D) 0
7. Kani's method can be considered as an extension of the :
- (A) Moment-area method
 (B) Slope deflection method
 (C) Moment distribution method
 (D) Column-analogy method
8. A three hinged parabolic arch is subjected to a udl of 30 kN/m on the left half of the span. It has a span of 16 m and central rise of 3 m. The horizontal thrust at the left support will be :
- (A) 80 kN (B) 120 kN
 (C) 182.3 kN (D) 160 kN
9. If a deformable structure in equilibrium under the action of a system of loads is given a small virtual deformation, then the virtual work done by the external forces is equal to the virtual work done by the internal forces. This principle is known as :
- (A) Principle of virtual displacements
 (B) Principle of virtual work
 (C) Principle of complimentary work
 (D) Principle of complimentary displacements

10. A column, hinged at both ends, is having an unsupported length of 3 m, second moment of area $I_{XX} = 400\text{cm}^4$, $I_{YY} = 120\text{cm}^4$ and area of cross-section 30cm^2 . The slenderness ratio of the column is equal to :
- (A) 150 (B) 120
(C) 130 (D) 82.2
11. Find the pressure represented by a column of 10 cm of water if specific weight of water is taken as 10kN/m^3 :
- (A) 1kN/m^2 (B) 1000kN/m^2
(C) 1N/m^2 (D) 100kN/m^2
12. The flow of a liquid at constant rate in a uniformly tapering pipe is :
- (A) Steady, uniform flow (B) Unsteady, uniform flow
(C) Steady, non-uniform flow (D) Unsteady, non-uniform flow
13. The line joining the piezometric heads at various points in a flow is known as the :
- (A) Total energy line (B) Hydraulic Gradient line
(C) Datum (D) None of the above
14. A jet of water coming out of a nozzle with velocity 50 m/s is having cross sectional area of 20cm^2 . The jet is directed against a fixed flat plate held normal to the jet. Find the force exerted on the plate :
- (A) 5000 N (B) 2000 N
(C) 5000 kN (D) 200 N
15. In a hydraulic jump occurring in a horizontal rectangular channel the sequent depths are 0.5 m and 1.5 m. The energy loss in this jump is :
- (A) 1 m (B) 1.5 m
(C) 2 m (D) 0.33 m
16. The evaporation through plants and from the surrounding soil together is called :
- (A) Infiltration (B) Interception
(C) Evapotranspiration (D) Transpiration
17. Find the delta for a crop if the duty for a base period of 100 days is 4320 hectares per cumec :
- (A) 0.1 m (B) 0.2 m
(C) 0.4 m (D) 1 m
18. In the single point method of finding the mean velocity across a vertical in a stream, if y is the depth of flow, the velocity is measured above the stream bed at :
- (A) $0.6y$ (B) $0.2y$
(C) $0.8y$ (D) $0.4y$

19. The surface joining the static water levels in several wells penetrating a confined aquifer represents :
- (A) water table surface
 (B) piezometric surface of the aquifer
 (C) capillary fringe
 (D) cone of depression
20. The time required by rain water to reach the outlet of drainage basin is generally called :
- (A) Time of concentration
 (B) Duration of the rainfall
 (C) Lag time
 (D) Recession time
21. The sum of exterior angles for a hexagon is :
- (A) 720
 (B) 1440
 (C) 900
 (D) 1080
22. If the included angle at station B in an open traverse ABCDE is $158^{\circ}24'$ then the deflection angle is :
- (A) $21^{\circ}36'L$
 (B) $21^{\circ}36'R$
 (C) $338^{\circ}24'R$
 (D) $338^{\circ}24'L$
23. The following perpendicular offsets were taken at 10 m intervals from a survey line to an irregular boundary line. The area in square metre enclosed between the survey line, irregular line, first and last offsets by Simpson's rule is :
- Perpendicular offsets, 5 m, 2 m, 4.5 m, 6 m, 1 m, 2 m, 4 m, 2.5 m, 4 m
- (A) 260 m^2
 (B) 520 m^2
 (C) 180 m^2
 (D) 360 m^2
24. The probable error of area (in m^2) of rectangle sides are $100 \pm 0.01 \text{ m}$ and $200 \pm 0.02 \text{ m}$ is :
- (A) ± 2
 (B) ± 0.0002
 (C) ± 0.02
 (D) ± 1.47
25. If the cross sectional areas at every 50 m, in a length of 200 m are : 5 m^2 , 10 m^2 , 15 m^2 , 10 m^2 , 5 m^2 then, volume by trapezoidal rule is
- (A) 4000 m^3
 (B) 5000 m^3
 (C) 2000 m^3
 (D) 3000 m^3
26. The covered area of a building measured at floor level is called :
- (A) Floor area
 (B) Plinth area
 (C) Carpet area
 (D) Circulation area
27. A building costs Rs. 40000. Considering scrap value as 10% of the cost and life as 60 years, the depreciated value after 20 years is :
- (A) 33800
 (B) 34800
 (C) 32800
 (D) 31800

28. Steel reinforcement bars in RCC is measured in :
(A) Quintals (B) Metre
(C) Number (D) Cu.m
29. The years purchase for 6% interest is :
(A) 20 (B) 13.33
(C) 16.67 (D) 0.06
30. For 45° cranked or bent up bar of dia “d”, the additional length of 2 bent up is approximately :
(A) 0.9 d (B) 0.45 d
(C) 0.3 d (D) 0.8 d
31. The initial setting time of Ordinary Portland cement as per BIS is :
(A) not more than 100 minutes (B) not more than 30 minutes
(C) not less than 30 minutes (D) less than 30 minutes
32. The main function of Alumina in brick earth is to :
(A) impart plasticity (B) increase durability
(C) prevent shrinkage (D) increase impermeability
33. Ultimate Strength of Ordinary Portland Cement is provided by :
(A) Tricalcium Silicate (B) Dicalcium silicate
(C) Tetracalcium alumino ferrite (D) Tricalcium aluminate
34. Proneness to segregation of fresh concrete is better tested by :
(A) Slump test (B) Flow test
(C) Vee Bee test (D) Compaction factor test
35. As the fineness modulus of aggregate increases its particle size :
(A) decreases (B) increases
(C) remains same (D) none of these
36. ‘Float’ which does not interfere with the start of the subsequent activity in a project is :
(A) Total float (B) Independent float
(C) Free float (D) Interfering float
37. Quality of reinforcing steel is evaluated by :
(A) Compressive strength (B) Tensile strength, ductility
(C) Yield strength, ductility (D) None of the above
38. Salt present in brick earth may cause :
(A) Brittleness (B) Efflorescence
(C) Discolouration (D) None of the above

39. One of the main demerits of using Lime mortar is that :
- (A) it is not durable (B) it does not set quickly
(C) it swells (D) it has plasticity
40. Grading of aggregates in a concrete mix is mainly essential to achieve :
- (A) Adequate workability (B) Higher density
(C) Reduction in voids (D) Better durability
41. Which of the following statements is not correct :
- (A) Seasoning of timber increases the strength
(B) Seasoning of timber increases the life
(C) Seasoning of timber results in dimensional instability
(D) Seasoning of timber reduces the weight
42. Choose the correct combination :
- | | |
|----------------|---------------------|
| 1. Retarder | P. Fly Ash |
| 2. Accelerator | Q. Superplasticizer |
| 3. Pozzolana | R. Gypsum |
| 4. Workability | S. Calcium chloride |
- (A) 1-R, 2-S, 3-P, 4-Q (B) 1-S, 2-R, 3-P, 4-Q
(C) 1-R, 2-P, 3-S, 4-Q (D) 1-R, 2-S, 3-Q, 4-P
43. Deformation in concrete due to sustained loading is :
- (A) Shrinkage (B) Creep
(C) Segregation (D) Bleeding
44. The foundation provided below a heavily loaded steel column on a soil of low bearing capacity is :
- (A) Isolated column footing (B) Grillage foundation
(C) Raft foundation (D) Strip footing
45. A bond in which both header and stretcher come in the same course is :
- (A) English bond (B) Raking bond
(C) Zigzag bond (D) Flemish bond
46. Which of the following does not belong to the class 'shell roof' :
- (A) Dome (B) Barrel vault
(C) Warped surface (D) Flat slab
47. Decoupling of the superstructure from substructure resting on a shaking ground is called :
- (A) Base isolation (B) Damping
(C) Shock absorption (D) Retrofitting

48. If t_o is the optimistic time, t_p is the pessimistic time and t_m is the most probable time, then the expected time of occurrence of an activity is :

(A) $t = \frac{t_o + 2t_m + t_p}{4}$

(B) $t = \frac{t_o + t_m + t_p}{3}$

(C) $t = \frac{t_o + 4t_m + t_p}{6}$

(D) $t = \frac{t_o + 2t_m + 3t_p}{6}$

49. Which of the statements given below is not correct :

When there is a dispute in a construction site,

(A) The dispute must be submitted initially to the site Engineer for decision, before referring to arbitration

(B) The contractor has to stop the work till the settlement of dispute

(C) All actions related thereto should be recorded and referred for future negotiations and agreements

(D) A meeting must be held between the superintendent and union leader

50. The planned or systematic actions necessary to provide enough confidence that a product or service will satisfy the given requirements is called :

(A) Quality control

(B) Quality improvement

(C) Quality Assurance

(D) Quality Audit

51. The Manning's formula is given by the expression:

(A) $V = \frac{1}{N} R^{\frac{2}{3}} S^{\frac{1}{2}}$

(B) $V = C\sqrt{R.S}$

(C) $V = 83.47R^{\frac{2}{3}}S^{\frac{1}{2}}$

(D) $V = 0.85CR^{0.63}S^{0.54}$

52. Detention period of grit chambers is kept as:

(A) 12 hours

(B) 5 minutes

(C) 24 hours

(D) 1 minute

53. The gas from sludge digestion tank is mainly composed of:

(A) Nitrogen

(B) Carbon dioxide

(C) Hydrogen Sulphide

(D) Methane

54. A pipe which is installed in the house drainage to preserve the water seal of traps is called:

(A) Vent pipe

(B) Anti-Siphonage pipe

(C) Waste pipe

(D) Soil pipe

55. In a BOD test 1.0 ml of raw sewage was diluted to 100 ml and the dissolved oxygen concentration of diluted sample at the beginning was 6 ppm and it was 4 ppm at the end of 5 day incubation at 20°C. The BOD of raw sewage will be:

(A) 100 ppm

(B) 200 ppm

(C) 300 ppm

(D) 400 ppm

56. The amount of residual chlorine left in public water supply for safety against pathogenic bacteria is about:
 (A) 0.01 to 0.05 ppm (B) 0.05 to 0.5 ppm
 (C) 0.5 to 1.0 ppm (D) 1.0 to 5.0 ppm
57. In water treatment, rapid gravity filters are adopted to remove:
 (A) Dissolved organic substances
 (B) Dissolved solids and gases
 (C) Floating solids and dissolved inorganic solids
 (D) Bacteria and colloidal solids
58. The percentage of chlorine in fresh bleaching powder is about:
 (A) 10 to 15 (B) 20 to 25
 (C) 30 to 35 (D) 40 to 50
59. The means of access for inspection and cleaning of sewer line is known as:
 (A) Inlet (B) Manhole
 (C) Drop manhole (D) Catch basin
60. The self cleaning velocity of the sewers is:
 (A) Less than 1.0 m/s (B) 1.0 m/s to 1.2 m/s
 (C) 1.5 m/s to 2.0 m/s (D) 3.0 m/s to 3.5 m/s
61. The limiting value of the depth of neutral axis ($x_{u,max} / d$) for Fe 500 grade steel bars as per IS 456-2000 is:
 (A) 0.53 (B) 0.48
 (C) 0.51 (D) 0.46
62. Where a member is built into a masonry wall which develops only partial restraint, the member shall be designed to resist a negative moment at the face of support is _____, Where W is total design load L is the effective span.
 (A) $WL/8$ (B) $WL/12$
 (C) $WL/16$ (D) $WL/24$
63. Basic Value of span to effective depth ratio for span up to 10 m of a continuous beam as per IS 456-2000:
 (A) 7 (B) 20
 (C) 24 (D) 26
64. The minimum area of steel in mm^2 has to be provided in a column of size $250 \text{ mm} \times 600 \text{ mm}$ is:
 (A) 1200 (B) 1500
 (C) 1800 (D) 2400

65. In a reinforced concrete footing, the thickness at the edge shall not be less than 150 mm for footing on soils nor less than _____ mm above the top of piles for footing on piles:
- (A) 250 mm (B) 300 mm
(C) 350 mm (D) 200 mm
66. Poisson's ratio of concrete is frequently taken as:
- (A) 0.15 – 0.25 (B) 0.5 – 0.75
(C) 0.05 – 0.15 (D) none of above
67. One way slabs are those in which most of the load is carried on the _____ span :
- (A) longest (B) shortest
(C) middle (D) quarter
68. The modulus of rupture of M25 Concrete may be taken as _____ N/mm² :
- (A) 3 (B) 3.5
(C) 4 (D) 4.5
69. Upright compression members that support decks in bridges are often called as:
- (A) Pile (B) Piers
(C) Pedestal (D) Stub
70. Slenderness ratio of a member is defined as the ratio of the effective length to the _____ of a section:
- (A) moment of inertia (B) radius of gyration
(C) thickness (D) area
71. The unsupported length of transverse ties should not exceed _____ times the diameter of tie in two directions:
- (A) 36 (B) 42
(C) 48 (D) 16
72. The full fixity at the column may be valid only for columns supported by:
- (A) an individual footing on rock (B) a thick pile cap
(C) a raft foundation (D) all of the above
73. A _____ section is one in which the area of tension steel is such that the ultimate limit state, the ultimate compressive strain in concrete is reached, However the tensile stain in the reinforcing steel is less than the yield strain:
- (A) balanced (B) under reinforced
(C) over reinforced (D) composite
74. In design practice of beams the span to overall depth ratio are generally taken in the range:
- (A) 10 to 16 (B) 25 to 30
(C) 1 to 2 (D) 30 to 45

75. Counter fort retaining wall is economical for heights above _____ m:
(A) 2 (B) 4
(C) 5 (D) 7
76. For preliminary calculations the thickness of the base slab of a retaining wall may be taken as _____ percent of the height of wall:
(A) 0.8 (B) .08
(C) 8 (D) 80
77. Considering the concept of durability of water tanks, the minimum grade of concrete shall be:
(A) M10 (B) M20
(C) M30 (D) M40
78. The permissible concrete stress in direct tension of M20 in calculation relating to resistance to cracking as per IS 3370-1965 part II is:
(A) 20 kg/cm^2 (B) 12 kg/cm^2
(C) 14 kg/cm^2 (D) 17 kg/cm^2
79. The permissible concrete stress in tension due to bending of M20 in calculation relating to resistance to cracking as per IS 3370-1965 part II is:
(A) 20 kg/cm^2 (B) 17 kg/cm^2
(C) 14 kg/cm^2 (D) 10 kg/cm^2
80. The method of prestressing concrete in which pre-stressing steel is tensioned against the hardened concrete is:
(A) Pre tensioning (B) post tensioning
(C) initial prestressing (D) jack tensioning
81. A normally consolidated clay settled 10 mm when effective stress was increased from 50 kN/m^2 to 100 kN/m^2 . If the effective stress is further increased from 100 kN/m^2 to 200 kN/m^2 , then further settlement of the clay shall be:
(A) 10 mm (B) 20 mm
(C) 30 mm (D) 40 mm
82. The time taken by clay layer to achieve 50% consolidation is 5 years. If the layer was half as thick, 5 times more permeable and 4 times more compressible then the time that would be required to achieve the same degree of consolidation is :
(A) 12 year (B) 5 year
(C) 1 year (D) 16 year
83. A soil sample has a shrinkage limit of 10% and specific gravity of soil solids as 2.7. The porosity of the soil at shrinkage limit is :
(A) 21.2% (B) 30%
(C) 52.7% (D) 70%

84. What is the range of silt size particles according to IS classification :
- (A) 4.75 mm to 2.00 mm (B) 2.00 mm to 0.425 mm
(C) 0.425 mm to 0.075 mm (D) 0.75 mm to 0.002 mm
85. In a falling head permeameter, a soil sample 75 mm in diameter and 36 mm in length was tested. At the commencement of the test, the initial head was 80 cm and after one hour, the head drops to 40 cm. The coefficient of permeability if the diameter of the stand pipe is 1 cm, in cm/sec will be :
- (A) 1.98×10^{-3} (B) 1.88×10^{-3}
(C) 1.98×10^{-2} (D) 1.23×10^{-5}
86. A vane 20 cm long and 10 cm in diameter was pressed into soft marine clay at the bottom of a bore hole. Torque was applied gradually and failure occurred at 2000 kg/cm, the cohesion of the clay in kg/cm² is :
- (A) $\frac{5}{\pi * 7}$ (B) $\frac{7}{\pi * 6}$
(C) $\frac{12}{\pi * 7}$ (D) $\frac{7}{\pi * 12}$
87. An un drained triaxial compression test is carried out on a saturated clay sample under a cell pressure of 200 kN/m². The sample failed at a deviator stress of 400 kN/m². The cohesion of the given clay sample is :
- (A) 50 kN/m² (B) 200 kN/m²
(C) 300 kN/m² (D) 400 kN/m²
88. Flow lines and equipotential lines meet each other at an angle :
- (A) 30 (B) 60
(C) 90 (D) 120
89. Newmark's chart is used in foundation engineering to determine :
- (A) earth pressure
(B) seepage loss
(C) permeability of soils
(D) stresses in soil due to surface loading
90. According to Terzaghi, the ultimate bearing capacity of a purely cohesive soil, at ground surface for a rough based footing is:
- (A) $5.14 C_u$ (B) $5.14 C_u + \gamma D_f$
(C) $5.7 C_u$ (D) None of the above
91. Application of bituminous material over an existing pavement surface which is relatively impervious is :
- (A) Prime Coat (B) Tack Coat
(C) Seal Coat (D) Surface Dressing

92. In flexible pavements, wheel load is distribute by :
- (A) Slab action (B) Directly to sub-grade
(C) Grain to grain transfer (D) Beam action
93. The distance travelled by a moving vehicle during total reaction time is:
- (A) Lag distance (B) Stopping distance
(C) Braking distance (D) Sight distance
94. Rate of change of centrifugal acceleration for computing length of transition curve for a vehicle with design speed V kmph is given by :
- (A) $\frac{70}{80 + V} \text{ m/s}^3$ (B) $\frac{80}{70 + V} \text{ m/s}^3$
(C) $\frac{80}{75 + V} \text{ m/s}^3$ (D) $\frac{75}{80 + V} \text{ m/s}^3$
95. The diagram showing the approximate path of vehicles and pedestrians involved in accidents is :
- (A) Spot map (B) Condition diagram
(C) Collision diagram (D) Desire line
96. The general equation relating flow (Q), density (K) and space mean speed (U) is :
- (A) $Q = \frac{K}{U}$ (B) $Q = \frac{U}{K}$
(C) $Q = U^K$ (D) $Q = KU$
97. Grade compensation on B.G tracks suggested in Indian railway is :
- (A) 0.02% (B) 0.03%
(C) 0.05% (D) 0.04%
98. Total correction for elevation, temperature and gradient for a runway should not exceed :
- (A) 35% (B) 25%
(C) 20% (D) 15%
99. V7 concept given by Le Corbusier refers to :
- (A) Neighbourhood planning (B) Housing Typologies
(C) Architecture Design principle (D) Hierarchy of Roads
100. PMGSY, a programme of the Government of India, deals with :
- (A) Urban Employment Generation (B) Rural Road Development
(C) Rural Employment Generation (D) Rural Electrification

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