062/23

Question Booklet Alpha Code

A

A

	Question Booklet Sl. No.

Total Number of Questions : 100 **Time : 90 Minutes**

Maximum Marks : 100

INSTRUCTIONS TO CANDIDATES

1. The Question Paper will be given in the form of a Question Booklet. There will be four versions of Question Booklets with Question Booklet Alpha Code viz. **A, B, C** & **D**.
2. The Question Booklet Alpha Code will be printed on the top left margin of the facing sheet of the Question Booklet.
3. The Question Booklet Alpha Code allotted to you will be noted in your seating position in the Examination Hall.
4. If you get a Question Booklet where the alpha code does not match to the allotted alpha code in the seating position, please draw the attention of the Invigilator IMMEDIATELY.
5. The Question Booklet Serial Number is printed on the top right margin of the facing sheet. If your Question Booklet is un-numbered, please get it replaced by new Question Booklet with same alpha code.
6. The Question Booklet will be sealed at the middle of the right margin. Candidate should not open the Question Booklet, until the indication is given to start answering.
7. Immediately after the commencement of the examination, the candidate should check that the Question Booklet supplied to him/her contains all the 100 questions in serial order. The Question Booklet does not have unprinted or torn or missing pages and if so he/she should bring it to the notice of the Invigilator and get it replaced by a complete booklet with same alpha code. This is most important.
8. A blank sheet of paper is attached to the Question Booklet. This may be used for rough work.
9. **Please read carefully all the instructions on the reverse of the Answer Sheet before marking your answers.**
10. Each question is provided with four choices **(A), (B), (C)** and **(D)** having one correct answer. Choose the correct answer and darken the bubble corresponding to the question number using Blue or Black Ball Point Pen in the OMR Answer Sheet.
11. **Each correct answer carries 1 mark and for each wrong answer 1/3 mark will be deducted. No negative mark for unattended questions.**
12. No candidate will be allowed to leave the examination hall till the end of the session and without handing over his/her Answer Sheet to the Invigilator. Candidates should ensure that the Invigilator has verified all the entries in the Register Number Coding Sheet and that the Invigilator has affixed his/her signature in the space provided.
13. Strict compliance of instructions is essential. Any malpractice or attempt to commit any kind of malpractice in the Examination will result in the disqualification of the candidate.

A

1. The point at which the stress-strain curve of a material ceases to be a straight line is called
   A) Elastic limit
   B) Limit of proportionality
   C) Yield point
   D) Ultimate stress

2. Which of the following statement is/are correct about bending moment ?
   A) Bending moment is defined as the algebraic sum of the moments of all the forces to the left of a section
   B) Bending moment is the algebraic sum of the moments of all the forces to the right of a section
   C) Bending moment is defined as the algebraic sum of the moments of all the forces either to the left or to the right of a section
   D) All the above

3. A sunshade is an example of which type of beam ?
   A) Simply supported beam
   B) Fixed beam
   C) Continuous beam
   D) Cantilever beam

4. If L is the unsupported length of the compression member, then the effective length of compression member effectively held in position at both ends, but not restrained against rotation is
   A) 0.65 L
   B) 0.8 L
   C) L
   D) 2 L

5. If M is the bending moment and EI is the flexural rigidity of a beam, then the strain energy due to bending is given by the equation
   A) $\int_0^L \frac{M^2 dx}{2EI}$
   B) $\int_0^L \frac{M^2 dx}{EI}$
   C) $\int_0^L \frac{M^2 dx}{4EI}$
   D) $\int_0^L \frac{2M^2 dx}{EI}$

6. The degree of indeterminacy of a propped cantilever beam subjected to inclined external loading is equal to
   A) 1
   B) 2
   C) 0
   D) 3

7. The influence line diagrams can be used for determining
   A) Dead load on the structure
   B) Live load on the structure
   C) Positions of loads for maximum shear force and bending moment values
   D) None of the above

8. Following assumptions are made while developing slope deflection method of analysis of a structure
   A) All joints are rigid
   B) Shear deformations are neglected
   C) Distortions due to axial deformations are neglected
   D) All

9. In the moment distribution method of analysis, the ratio of the moment shared by a member to the applied moment at the joint is called
   A) Distribution factor of that member
   B) Stiffness of the beam
   C) Relative stiffness of the beam
   D) Carry over factor

10. An example of a statically determinate structure is
   A) Three hinged arch
   B) Two hinged arch
   C) Single hinged arch
   D) Fixed arch

11. In vortex motion in which the fluid particles travel along circular path, the magnitude of the velocity of the fluid particle is found to be
   A) Constant along the circular path
   B) Varying along the circular path
   C) Varying in a direction perpendicular to circular path
   D) Zero

12. In the case of a fluid flowing under constant head H through a circular orifice fixed in the side wall of a large container, the coefficient of velocity C_v
   A) Varies from 0.95 to 0.98
   B) Slightly smaller than unity
   C) Slightly larger than unity
   D) Unity

13. Which of the following statement is/are correct about reaction turbines ?
   A) Water enters the turbine under pressure hence it has pressure energy and kinetic energy
   B) In axial flow turbines, the flow is parallel to the axis of the wheel
   C) Both A) and B)
   D) None

14. Centrifugal pumps are classified into volute pumps and diffuser pumps based on
   A) Position of shaft
   B) Type of casing
   C) Number of stages
   D) Suction

15. In the case of floating bodies, the condition of stable equilibrium is obtained when the metacentre
    A) Lies above centre of gravity and centre of buoyancy
    B) Lies below centre of gravity and lies above centre of buoyancy
    C) Coincides with centre of buoyancy
    D) Coincides with centre of gravity

16. A Hydrograph represents
    A) Graphical plot of a stream discharge against the corresponding percent of time the discharge was exceeded
    B) Cumulative flow volume versus time curve
    C) Temporal variation of total runoff at a gauging point in a stream
    D) None

17. Infiltration property of a soil depends on
    A) Soil properties
    B) Initial soil moisture content
    C) Previous wetting history
    D) All

18. Well yield per unit drawdown in the well is known as the
    A) Specific yield
    B) Specific retention
    C) Specific capacity
    D) Cone of depression

19. Applications of hydraulic jump include
    A) Dissipation of energy of flow downstream of hydraulic structures
    B) The maintenance of high water levels in channels
    C) The mixing of chemicals for water purification
    D) All

20. If the coefficient of variation of the annual rainfall for a region is found to be 15, then it is
    A) Region of high rainfall
    B) Region of scanty rainfall
    C) Snowy region
    D) None

21. An example of a level surface is
    A) Top surface of a dining table
    B) Floor surface of a building
    C) Still water surface of a lake
    D) Surface of a piece of plywood

22. When the contour lines having the same contour interval are farther apart, it shows a
    A) Gentle slope
    B) Very steep slope
    C) Plane surface
    D) Ridge or a valley

23. If three consecutive ordinates are taken at 2 m intervals from a traverse line and measured as 1.8 m, 2.5 m and 2.0 m, then the area between the traverse line, the first and last ordinates and the boundary, by trapezoidal rule, is
    A) 21.6 m^2 B) 17.6 m^2 C) 8.8 m^2 D) 7.6 m^2

24. The error in the horizontal circle readings due to the line of collimation not being perpendicular to the trunnion axis is eliminated by
    A) Taking readings on the different parts of the horizontal circle
    B) Taking readings on both the faces
    C) Removing the parallax
    D) Transiting the telescope

25. Modern Electronic Distance Measuring instruments work on the principle of measuring
    A) Reflected energy generated by electromagnetic waves
    B) Total time taken by electromagnetic wave in travelling the distance
    C) Change in frequency of the electromagnetic waves
    D) Phase difference between the transmitted and the reflected electromagnetic waves

26. The global positioning system operated by the US Department of Defence uses
    A) 6 satellites B) 12 satellites C) 18 satellites D) 24 satellites

27. How many modular bricks of size 200 mm x 100 mm x 100 mm are required for 100 cubic metre of masonry wall ?
    A) 5000 B) 50000 C) 500 D) 1000

28. What percentage of the estimated cost of building works is assumed for sanitary and water supply works in the estimate of a building ?
    A) 8% B) 10% C) 7% D) 5%

29. If L is the length of the reinforcing bar and d is the diameter, the total length of straight bar hooked at both the ends is

A) L + 9 d B) L + 12 d C) L + 18 d D) L + 6 d

30. A construction equipment was purchased for Rs. 2,00,000. If the useful life is estimated as 5 years, find the percentage of average annual cost of the equipment to the original cost assuming no scrap value.

A) 60 B) 50 C) 20 D) 40

31. Permissible moisture content in timber doors of thickness 50 mm and above, in Zone IV is

A) 12% B) 16% C) 14% D) 20%

32. Maximum cement content for conventional Reinforced Cement concrete is

A) 300 kg/m^3 B) 360 kg/m^3 C) 450 kg/m^3 D) 500 kg/m^3

33. If the fineness modulus of a sample of fine aggregates is 4.3, the mean size of particles in the sample is between

A) 1.18 mm and 2.36 mm B) 2.36 mm and 4.75 mm

C) 0.30 mm and 0.60 mm D) 0.15 mm and 0.30 mm

34. Which test is used to study the resistance of aggregates to weathering action ?

A) Crushing test B) Abrasion test

C) Soundness test D) Impact test

35. Minimum grade of concrete to be used in reinforced concrete structures constructed along the seacoast

A) M30 B) M20 C) M40 D) M25

36. For mix design of M25 concrete, the standard deviation assumed as per IS 10262-2019 is

A) 3.5 B) 4.0 C) 4.5 D) 5.0

37. As per IS guidelines, for under-water concreting, the water-cement ratio shall not exceed

A) 0.60 B) 0.50 C) 0.45 D) 0.40

38. The lower half portion of an arch between the crown and the skewback is known as
A) Spandril B) Arcade C) Ring D) Haunch

39. Which of the following type of door can allow air circulation and privacy even when it is closed ?
A) Part panelled, part glazed door
B) Flush door
C) Louvered door
D) Wire gauge door

40. Floor Area Ratio (F.A.R.) is defined as
A) The ratio of floor area inclusive of all the floors to the area of plot on which building stands
B) The ratio of open spaces to the area of plot on which building stands
C) The ratio of total area of the location to the area of plot on which building stands
D) The area of plot on which building stands

41. Which arrangement is used for preventing the slip of earth in foundation trenches when excavation is carried out in moderately firm ground and the depth of excavation does not exceed 2 m ?
A) Stay bracing
B) Box sheeting
C) Sheet piling
D) Vertical sheeting

42. As per IS 4591-2002, the rated speed of the escalator shall not be more than
A) 40 metres per minute
B) 24 metres per minute
C) 38 metres per minute
D) 30 metres per minute

43. Which of the following concept is usually adopted for seismic strengthening of structural elements ?
A) Weak column, strong beam
B) Strong column, strong beam
C) Strong column, weak beam
D) Weak column, weak beam

44. Which of the following non-destructive test follows the principle of analysis of the noises created when materials deform or fracture ?
A) Acoustic emission technique
B) Rebound hammer test
C) Ultrasonic pulse velocity test
D) Windsor probe test

45. In PERT analysis, the time estimates of activities and probability of their occurrence follow
    A) Normal distribution curve
    B) Poisson's distribution curve
    C) Rayleigh distribution curve
    D) Beta distribution curve

46. In an activity, if the latest start time is 28 days and the earliest start time is 18 days, then the total float shall be
    A) 46 days B) 10 days C) 9 days D) 5 days

47. Quality control cost estimated as
    A) Prevention cost + Appraisal cost
    B) Failure cost + Prevention cost
    C) Prevention cost + Internal failure cost
    D) Internal failure cost + External failure cost

48. What shall be the minimum distance of a powerline from any component of scaffold ?
    A) 1.5 m B) 2.5 m
    C) 3 m D) 4 m

49. As per IS 13920-2016, minimum dimension of a column shall be
    A) 300 mm B) 200 mm
    C) 250 mm D) 400 mm

50. Which of the following statements is correct, in the context of acceptance criteria of concrete specified in IS 456-2000 ?
    Statement 1 : If the strength of three cubes tested at 28 days is 21, 24 and 23 MPa, the concrete can be considered as acceptable as M20 grade concrete.
    Statement 2 : If the strength of three cubes tested at 28 days is 21, 24 and 23 MPa, the concrete can be considered as acceptable as M25 grade concrete.
    A) Both statements are true
    B) Statement 1 is true and statement 2 is false
    C) Statement 1 is false and statement 2 is true
    D) Both statements are false

51. For a town with population 40,000, the average daily demand is 200 litres/capita/day and five demand is 4000 litres/minute. The peak demand is
A) 27.36 Million litres/day B) 20.16 Million litres/day
C) 21.60 Million litres/day D) 37.92 Million litres/day

52. Rotary pumps are classified under
A) Impulse pumps B) Displacement pumps
C) Reciprocating pumps D) Centrifugal pumps

53. A centrifugal pump is required to lift 1.5 cubic metres of water per second to a height of 7 metres. If total losses in the pipes is 0.5 metres, the minimum HP of the driving engine to run the pump is (Assume efficiency 60%)
A) 300 HP B) 200 HP C) 250 HP D) 150 HP

54. A continuous flow settling tank has the following parameters :
Length of settling zone = L
Depth of water in settling zone = H
Horizontal velocity of flow of water = V
Settling velocity of particle = V_s
The condition for a particle to enter the sludge zone is
A) $\frac{L}{V} > \frac{H}{V_s}$ B) $\frac{L}{V} < \frac{H}{V_s}$ C) $\frac{L}{V_s} > \frac{H}{V}$ D) $\frac{L}{V_s} < \frac{H}{V}$

55. The coagulant which can be used for treating water to be used in boilers is
A) Ferric chloride B) Alum C) Ferric sulphate D) Sodium aluminate

56. The proportionate depth for a sewer of diameter 'D' running partially full at depth 'd' and having 'α' as central angle in degrees is
A) $\frac{1}{2}\left(1-\sin \alpha/2\right)$ B) $\frac{1}{2}\left(1-\sec \alpha/2\right)$ C) $\frac{1}{2}\left(1-\tan \alpha/2\right)$ D) $\frac{1}{2}\left(1-\cos \alpha/2\right)$

57. 25 ml of sewage is diluted to 250 ml. DO concentration of diluted sample at the beginning of BOD test was 8 mg/l and 6 mg/l after 5 days incubation at 20°C. The corresponding DO values for the dilution water were 8.2 mg/l and 8 mg/l. The BOD of the sewage is
A) 18.2 mg/l B) 20 mg/l C) 182 mg/l D) 200 mg/l

58. Dumping is avoided as a disposal method when screenings are from
A) Medium and coarse screens B) Coarse screens
C) Screens with shredders D) Medium and fine screens

59. A circular trickling filter is treating 5 Million litres of sewage per day. The BOD is 100 mg/l. The organic loading rate is 1000 kg/hectare metre/day. The hydraulic loading rate is 25 Million litres/hectare/day. The effective depth of filter is
A) 2 m B) 2.5 m C) 1.5 m D) 2.2 m

60. Highly stable atmosphere occurs when lapse rate is
A) isothermal B) normal C) adiabatic D) negative

61. The recommended value of maximum water cement ratio for concrete using 20 mm nominal maximum size aggregates subjected to extreme exposure is
A) 0.45 B) 0.4 C) 0.5 D) 0.55

62. In Limit State method, which of the following statements is correct ?
A) Permissible strain have an upper limit for concrete and strain variation across the cross section is linear
B) Stress variation across the section of concrete is linear and the maximum stress value is limited
C) Stress variation across the section of concrete is linear and the maximum strain value is limited
D) None of the above

63. The bending moment corresponding to the first cracking for a simply supported plain concrete beam of 200 mm wide and 300 mm deep, subjected to two equally spaced point loads given that the grade of concrete is M25
A) 10.5 kNm B) 12 kNm C) 21 kNm D) 5.25 kNm

64. Thickness of slab is 70 mm. The maximum dia. of reinforcement that can be used is
A) 8 mm B) 10 mm C) 12 mm D) 16 mm

65. The long term static modulus of elasticity of concrete is
A) More than short term modulus of elasticity
B) May be more or less than short term modulus depending on the strength of concrete
C) Long term modulus can be as low as “1/2.6” of short term static modulus of elasticity
D) None of the above

66. For a simply supported beam of span 11 m, the minimum effective depth required assuming tension and compression modification factors as 1.0 and 1.1 is
A) 550 mm B) 600 mm C) 650 mm D) 700 mm

67. For beams with Fe 500 steel Xumax/d and Mulimit are given by
A) 0.53 and 0.148 $f_{ck}bd^2$ B) 0.48 and 0.148 $f_{ck}bd^2$
C) 0.46 and 0.138 $f_{ck}bd^2$ D) 0.46 and 0.133 $f_{ck}bd^2$

68. The development length in compression for high yield strength deformed bars is given by $L_d = \frac{\phi\sigma_s}{k\tau_{bd}}$ terms have the usual significance and “k” is a constant. The value of “k” is
A) 3.2 B) 6.4 C) 8 D) 5

69. The minimum effective length ratio-effective length/unsupported length-to be considered for sway columns is

A) 1.0 B) 1.2 C) 1.4 D) 2

70. A column of size 400 mm×400 m have 4 nos of 25 mm bars and 4 nos of 12 mm bars. The size and spacing of lateral ties recommended is

A) 6 mm @ 300 mm c/c
B) 8 mm @ 190 mm c/c
C) 8 mm @ 300 mm c/c
D) 10 @ 300 mm c/c

71. Ideal location of lapping of reinforcement if required for a beam supported at ends is

A) For top bars-near to centre of span and for bottom bars-near supports
B) Top bars-near supports, bottom bars-near centre
C) Lapping of reinforcement can be done anywhere, provided there is no congestion
D) Top and bottom bars-near to beam supports

72. The maximum width of surface cracks as per IS 3370 Part II shall not exceed

A) 0.1 mm B) 0.15 mm C) 0.2 mm D) 0.3 mm

73. The two way shear stress in the case of a square isolated footing having size of side "a" and supporting a square column having side "b" and when effective depth "d" and uniform soil pressure "S" is obtained as

A) $S(a^2 – (b+d)^2)/4(b+d)d$
B) $S(a^2 – b^2)/8(b+d)d$
C) $S(a^2 – (b+d)^2)/16(b+d)d$
D) $S(a^2 – b^2)$

74. The statement "fillet welds of size closer to the minimum size of weld are preferred as it is more economical" is

A) True
B) False-Bigger size fillets are better
C) Weld size is dependent on site conditions
D) No such preferences

75. The shear capacity of bolts is reduced

I) When total thickness of connected plates exceeds 5 times the nominal diameter of bolts.

II) When packing plates are more than 6 mm thick.

A) Both the above statements are true as bolts are subjected to bending

B) Only the second statement is correct

C) Shear capacity of bolt is evaluated without considering the above factors

D) Only the first statement is correct

76. An unequal angle is connected using one leg and used as a tension member. Which leg is to be connected ?

A) Long leg to be connected

B) Short leg to be connected as it is more efficient to take care of shear lag effects

C) Which leg is connected is immaterial

D) Depending upon the type of connection like welding or bolting, the connected leg to be selected

77. A simply supported concrete beam of effective span 8 m is given a parabolic tendon profile for load balancing. If the gravity load applied is 20 kN/m and prestressing force is 1600 kN, the central dip of cable profile is

A) 0.1 m B) 0.2 m C) 0.3 m D) 0.15 m

78. The final deflection due to all loads including the effects of temperature, creep and shrinkage and measured from the as-cast level of the supports of floors, roofs and all other horizontal members, should not normally exceed span/X where X is

A) 300 B) 350 C) 250 D) 400

79. The unfactored dead-20 kN/m, live 15 kN/m and wind 10 kN/m loads are available for a beam design. The design load for limit state design is

A) 52.5 kN/m B) 54 kN/m C) 45 kN/m D) 33 kN/m

80. The maximum effective slenderness ratio for a member subjected to compressive forces resulting only from combination of wind or earthquake actions, such that the deformation of such member does not adversely affect stresses in any part of structure is

A) 300 B) 250 C) 180 D) 350

81. A fine grained soil has liquid limit of 60 and plastic limit of 20. As per the plasticity chart the soil is
A) ML B) CH C) CL D) MI

82. A clay sample of 10 mm thick requires 10 minutes for 50% consolidation. What will be the time required for 50% consolidation if the thickness of clay layer is 1 m at site ?
A) 10^3 minutes B) 10^2 minutes C) 10^5 minutes D) 10^6 minutes

83. Permeability of soil is directly proportional to
A) e B) e^2 C) 1/e D) e^3

84. What will be the effective stress at a depth of 5 m below a clay layer of saturated unit weight of 20 kN/m^3 ?
A) 100 kN/m^2 B) 50 kN/m^2 C) 75 kN/m^2 D) 25 kN/m^2

85. On which type of soil wash boring is not applicable
A) Cohesive soil B) Cohesion less soil
C) Soil with gravel and boulders D) All the above

86. The degree of disturbance of a cohesive sample can be estimated by
A) Recovery ratio B) Void ratio
C) Consolidation ratio D) Over consolidation ratio

87. Disturbed samples can generally be used for
A) Consolidation test B) Specific gravity test
C) Permeability test D) Shear strength test

88. An unsupported excavation is to be made in clay layer with unit weight of 20 kN/m^3 and C = 40 kN/m^2. The depth of tension crack will be
A) 8 m B) 2 m C) 4 m D) 6 m

89. For a saturated normally consolidated clay specimen the pore pressure coefficient B will be
A) 1.0 B) 0.8 C) 0.2 D) – 0.5

90. The ratio of unconfined compressive strength of an undisturbed sample of soil to that of a remoulded sample, at the same water content is known as
A) Activity B) Damping C) Plasticity D) Sensitivity

91. Transition curves are provided in highways to
A) Introduce super elevation gradually
B) Introduce extra widening gradually
C) Improve design speed on horizontal curves
D) All the above

92. If a vehicle is moving with a speed of 80 kmph, the absolute minimum sight distance required if t = 2.5 s and f = 0.36 is

A) 200 m B) 125 m C) 640 m D) 250 m

93. Which type of rail is commonly used in railways ?

A) Bridge rail B) Grooved rail C) Flat bottom rail D) Barlow rail

94. The percentage of voids in a sample of aggregate which is compacted in a standard manner is known as

A) Index number B) Angularity number

C) Shape number D) Uniformity number

95. If sleeper density is (n + 4) for a broad gauge railway track, what will be the number of sleepers required for 1 km of railway track, if the length of one rail for a broad gauge is 13 m ?

A) 1118 B) 1200 C) 1308 D) 1700

96. Recommended land width for expressways is

A) 50-60 m B) 20-30 m C) 30-40 m D) 10-20 m

97. The defined path fixed on an aerodrome established for the aircraft to travel from one place to another

A) Transient apron B) Runway

C) Taxiway D) None of the above

98. The % by weight of the aggregates whose thickness is less than $3/5^{th}$ of their mean dimension

A) Angularity Index B) Elongation Index

C) Flakiness Index D) Roundness Index

99. The desire lines in traffic survey is plotted based on which of the following data

A) Classified volume B) Accident

C) Speed and delay D) Origin and Destination

100. The standard plate size in a plate bearing test for finding modulus of sub grade reaction (k) value is

A) 100 cm diameter B) 30 cm diameter

C) 75 cm diameter D) 50 cm diameter

Space for Rough Work