

102/21

Question Booklet Alpha Code

A

Question Booklet Sl. No.

Total Number of Questions : 100

Time : 75 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.

102/21

A

-2-

1. An axial tensile force is acting on a body and normal strain in axial direction is 1.2 mm/m. If Poisson's ratio is 0.32, what will be the volumetric strain ?

A) 3.32×10^{-4}	B) 4.32×10^{-4}
C) 5.32×10^{-4}	D) 6.32×10^{-4}

2. The major and minor principal stresses at a point are 2.5 MPa and – 2.0 MPa respectively. The maximum shear force at the point is

A) Zero	B) 0.25 MPa
C) 2.05 MPa	D) 2.25 MPa

3. A cantilever beam of 5 m carries a uniformly distributed load of 10 kN/m throughout the span. What is the maximum bending moment ?

A) 125 kNm	B) 150 kNm
C) 175 kNm	D) 200 kNm

4. A simply supported beam of span l is subjected to a concentrated load of W at its mid span and a uniformly distributed load of equality W . What is the total deflection of the beam at midpoint ?

A) $Wl^3/384 EI$	B) $5Wl^3/384 EI$
C) $13Wl^3/384 EI$	D) $48Wl^3/384 EI$

5. Slenderness ratio is the ratio of effective length to

A) Actual length	B) Radius of gyration
C) Factor of safety	D) Direct stress

6. The fixed end moment of a uniform beam of span l and fixed at its ends subjected to a uniformly distributed load of intensity w /unit length is

A) $wl^2/8$	B) $wl^2/10$	C) $wl^2/12$	D) $5wl^2/12$
-------------	--------------	--------------	---------------

7. What is the maximum positive shear force at the quarter span at section C from left end when a uniformly distributed load longer than the span of intensity 20 kN/m crosses the span of 12 m ?

A) 50 kN	B) 57.5 kN	C) 60 kN	D) 67.5 kN
----------	------------	----------	------------

8. The horizontal thrust of a two hinged arch which carries a uniformly distributed load of w /unit run over its entire span. The span is l and rise h .

A) $wl^2/8h$	B) $8wl^2/h$	C) $wl^2/4h$	D) $4wl^2/h$
--------------	--------------	--------------	--------------

102/21

9. The point of contraflexure is the point where
A) Shear forces changes the sign B) Shear force minimum
C) Bending moment changes the sign D) Bending moment maximum
10. In moment distribution method, the sum of distribution factors of all the members meeting at any joint is always
A) Zero B) Less than 1
C) 1 D) Greater than 1
11. What is the depth of a point below water surface in sea where the pressure intensity is 1.006 MPa ? Take specific gravity of sea water = 1.026 and specific weight of water as 9810 N/m³.
A) Zero B) 9.81 m C) 49.05 m D) 100 m
12. A uniform wooden cylinder has a specific gravity of 0.8. Find the ratio of submerged height to length of the cylinder so that it will just float upright in a state of neutral equilibrium in water.
A) 0.4 B) 0.53 C) 0.8 D) 1.0
13. Which one of velocity component sets given below satisfies the continuity equation ?
A) $u = 2x; v = -2y$ B) $u = x + y; v = x - y$
C) $u = 2x^2 + y; v = 4x - y$ D) None of the above
14. A triangular V-notch channel is conveying a discharge of 0.7 m³/s. If the percentage error in measuring the head is 1.2%, the percentage error in discharge is
A) 1.2% B) 1.4% C) 2.2% D) 3.0%
15. The number of buckets on the periphery of a Pelton wheel is
(Where D – Mead diameter of the Pelton Wheel, d – least diameter of jet)
A) $\frac{D}{d} + 5$ B) $\frac{D}{2d} + 5$ C) $\frac{D}{2d} + 15$ D) $\frac{D}{2d} + 20$
16. The maximum average depth due to one day storm over an area of 100 km² is 15 cm. Depth-area-duration curve indicates that for the same area, maximum average depth for a 3 hours storm will be
A) 7.5 cm B) Less than 7.5 cm
C) 15 cm D) More than 15 cm

A

17. If the depth is 7.24 cm on a field over a base period of 12 days, then the duty is
A) 100 hectare per cumec B) 1242 hectare per cumec
C) 1432 hectare per cumec D) 1724 hectare per cumec
18. The intensity of irrigation is the
A) Percentage of gross command area to be irrigated annually
B) Percentage of culturable command area to be irrigated annually
C) Percentage of minimum land area to be irrigated annually
D) Percentage of total land area to be irrigated annually
19. A channel designed by Lacey's theory has a velocity of 1.5 m/s. If the silt factor is 1.0, then the hydraulic mean radius of the channel is
A) 3.75 m B) 4.25 m C) 4.50 m D) 4.75 m
20. Total capacity of a reservoir is 8000000 m^3 and dead storage is 8000 m^3 . If average volume of sediment deposition is $100 \text{ m}^3/\text{year}$, the usefulness of the reservoir will start reducing after
A) 20 years B) 40 years C) 80 years D) 160 years
21. The value of property or structure becomes less, by its becoming out of date in style, in structural design etc., which is termed as
A) Capital cost B) Salvage value
C) Obsolescence D) Loss of rent
22. Book value is the amount shown in the account book after allowing necessary
A) Taxes B) Scrap value
C) Depreciation D) Loss of rent
23. The Polar axis of earth is shorter than Equatorial axis by
A) 42.95 m B) 95.42 m
C) 43.5 km D) 142.95 km
24. Error due to atmospheric refraction is known as _____ in levelling.
A) Instrumental error B) Natural error
C) Personal error D) Error in sighting

102/21

25. _____ is a branch of angular surveying in which the horizontal and vertical distances of points are obtained by optical means.
A) Resection B) Traversing C) Tacheometry D) Radiation
26. In the case of Prismoidal formula, it is necessary to have _____ number of sectional areas.
A) Even numbers B) Odd numbers
C) Maximum 100 D) Minimum 3
27. The amount of money including whole annual interest at the prevailing rate of interest, which is equal to the net income from the property is
A) Capitalised value B) Reteable value
C) Annuity D) Book value
28. A person who takes the lease is known as
A) Leaser B) Lessee
C) Owner D) Short term owner
29. Minimum grade of Concrete for RCC as per IS 456 : 2000 is
A) M10 B) M15 C) M20 D) M25
30. Minimum Cement content required for M20 grade concrete in RCC is
A) 260 kg/m³ B) 300 kg/m³ C) 320 kg/m³ D) 340 kg/m³
31. Which of the phases in the concrete microstructure exercise the greatest influence on mechanical properties of the concrete ?
A) Coarse aggregate B) Interfacial transition zone
C) Hydrated cement paste D) Fine aggregate
32. Needle shaped solids which appear during the hydration of cement in its microstructure level is called
A) Ettringite B) Belite
C) Calcium Silicate Hydrate D) Calcium Hydroxide
33. Slump value for concrete, accepted for ordinary RCC work is
A) 150 mm B) 25 mm C) 30 mm D) 100 mm

A

34. Which of these cracks are due to externally applied loads and not intrinsic to concrete ?
- Plastic Cracks
 - Early Age Thermal Cracks
 - Drying Shrinkage Cracks
 - None of the above
35. Among tests used for finding tensile strength of concrete, which of the following test will give largest numerical value ?
- Direct tension test
 - Split tensile test
 - Flexure test
 - All of the above show the same result
36. Maximum carbon content for medium carbon steel
- | | |
|---------|---------|
| A) 0.7% | B) 0.8% |
| C) 0.9% | D) 1% |
37. The vertical component of a panelled door on which the lock and aldop is placed is called
- | | |
|---------------|---------------|
| A) Lock Rail | B) Lock Style |
| C) Lock Panel | D) Mid Rail |
38. As per IS 399:1963 "Classification of Commercial Timbers and Their Zonal Distribution", weight per cubic metre of various timber is standardised at _____ moisture content.
- | | |
|--------|--------|
| A) 6% | B) 8% |
| C) 10% | D) 12% |
39. In Ordinary Portland Cement, compounds in decreasing order of percentage composition
- | | |
|---------------------------------|---------------------------------|
| A) $C_3S > C_2S > C_3A > C_4AF$ | B) $C_2S > C_3S > C_3A > C_4AF$ |
| C) $C_2S > C_3S > C_4AF > C_3A$ | D) $C_3S > C_2S > C_4AF > C_3A$ |
40. Innermost Central Portion of a tree is
- | | |
|------------|------------------|
| A) Pith | B) Heartwood |
| C) Sapwood | D) Cambium layer |

102/21

41. During the setting and early hardening period (first 24 hrs.) of Portland cement, the Heat Liberation Rate
- A) Increases linearly from zero to peak
 - B) Peaks at the start, then decreases before increasing again to second peak and then decreasing again
 - C) Starts near zero at the start and gradually increases to peak and then decreases
 - D) Peaks at the start, then keeps decreasing
42. Which of the following is not a mineral admixture ?
- A) Fly ash
 - B) Silica fume
 - C) Rice husk ash
 - D) Superplasticizer
43. In ferrocement construction, what is the reinforcement ?
- A) 8 mm rod
 - B) 6 mm rod
 - C) 4 mm rod
 - D) Wire-mesh
44. Out of Court dispute resolution in construction project, does not include
- A) Arbitration
 - B) Conciliation
 - C) Mediation
 - D) Litigation
45. TMT in TMT steel bar stands for
- A) Thermo Mechanically Treated
 - B) Twisted Mild Tempered
 - C) Temperature Maintained Twisted
 - D) Torsion Maintained and Treated
46. The following is not the direct cost of accident
- A) Medical care expense
 - B) Insurance premium
 - C) Workman's compensation cost
 - D) Cost of slowdown in operation
47. The compound responsible for early setting time of cement is
- A) Tricalcium aluminate
 - B) Dicalcium silicate
 - C) Tricalcium silicate
 - D) Tetracalcium aluminoferrite
48. In construction material management and procurement, what is the planned wastage for cement ?
- A) 2%
 - B) 5%
 - C) 10%
 - D) 3%

A

49. Which of the following is not related to Quality Assurance in Construction ?
- | | |
|------------------------|--|
| A) Concrete mix design | B) Sampling testing of steel |
| C) Testing of cement | D) Sampling of concrete during placing |
50. Total indirect cost of a project includes
- Overheads + Outage Loss + Labour Charge
 - Overheads + Outage Loss
 - Outage Loss + Managerial Cost
 - Stationary Cost + Office Cost
51. As per IS 456, 'pedestal' is a vertical compression member whose effective length is
- Less than two times its least lateral dimension
 - Less than three times its least lateral dimension
 - Less than four times its least lateral dimension
 - Less than twelve times its least lateral dimension
52. Shear strength of a reinforced concrete beam depends on
- | | |
|------------------------|--------------------------|
| A) Steel reinforcement | B) Area of cross section |
| C) Grade of concrete | D) All the above |
53. As per IS 456, the maximum cross-sectional area of longitudinal bars in an RCC column with gross area A_g is
- | | |
|----------------|----------------|
| A) 6% of A_g | B) 5% of A_g |
| C) 3% of A_g | D) 1% of A_g |
54. For footings, concrete sections of thickness greater than 1 m, the nominal reinforcement per metre length in each direction on each face shall be
- | | | | |
|------------------------|------------------------|------------------------|------------------------|
| A) 360 mm ² | B) 380 mm ² | C) 400 mm ² | D) 420 mm ² |
|------------------------|------------------------|------------------------|------------------------|
55. For limit state method of design, the permissible bearing stress on full area of concrete shall be
- | | | | |
|------------------|------------------|------------------|------------------|
| A) 0.25 f_{ck} | B) 0.30 f_{ck} | C) 0.35 f_{ck} | D) 0.45 f_{ck} |
|------------------|------------------|------------------|------------------|
56. The ratio of design strength of a tied reinforced RCC column to a spiral reinforced RCC column is
- | | | | |
|---------|--------|---------|---------|
| A) 0.95 | B) 1.0 | C) 1.10 | D) 1.15 |
|---------|--------|---------|---------|

A

102/21

57. For a column with diameter 180 mm and reinforcing bars 12 mm, minimum possible clear cover is
- A) 20 mm B) 25 mm
C) 30 mm D) 40 mm
58. As per IS 456 the structure shall have a factor of safety against sliding not less than
- A) 1.2 B) 1.3 C) 1.4 D) 1.5
59. For braced columns, the effective length is between
- A) l and $2l$ B) $0.5l$ and $2l$
C) $0.5l$ and l D) $0.5l$ and $1.5l$
60. An RCC water tank to be designed for a volume of 25 m^3 , not located in coastal area. As per Indian standards, the minimum possible grade of concrete is
- A) M20 B) M25 C) M30 D) M35
61. As per IS 3370, parts of RCC structure retaining the liquid or enclosing the space above the liquid shall be considered as subject to at least
- A) Mild exposure condition B) Moderate exposure condition
C) Severe exposure condition D) Very severe exposure condition
62. The minimum reinforcement required for RCC tank walls, using mild steel is
- A) 0.64% B) 0.35% C) 0.15% D) 0.12%
63. The minimum eccentricity to be considered in the design of a long RCC column is
- A) 25 mm B) 20 mm C) 10 mm D) 5 mm
64. For pre-tensioned prestressed concrete, the grade of concrete shall be not less than
- A) M45 B) M40 C) M35 D) M30
65. Which of the following is not a cause for immediate loss in the case of prestressed concrete ?
- A) Elastic shortening B) Friction
C) Anchorage slip D) Relaxation

A

66. A post-tensioned prestressed concrete beam consists of a single tendon of area 100 mm^2 . If the stress in concrete at the level of steel is 6 N/mm^2 and modular ratio is 6, the loss in prestress due to elastic shortening is
- A) 6 N/mm^2 B) 36 N/mm^2
C) 1 N/mm^2 D) 0 N/mm^2
67. The level of prestressing in a beam is such that no tensile stress is allowed in concrete under service loads. As per IS : 1343 classification, the beam is
- A) Type 1 B) Type 2
C) Type 3 D) Type 4
68. In a bolted connection, the centre-to-centre distance between individual fasteners in a line, in the direction of load is called
- A) Gauge distance B) Edge distance
C) Pitch D) Limiting distance
69. As per IS 800, the partial safety factor for materials γ_m is in the range
- A) 1.1 to 1.5 B) 1.0 to 1.25
C) 1.25 to 2.0 D) 1.0 to 1.5
70. When the length of a connection increases, the shear lag effect
- A) Increases B) Reduces
C) Has no change D) None of the above
71. Geometric increase method of population forecasting is based on the assumption that
- A) Growth rate is progressively increasing
B) Growth rate is constant
C) Percentage growth rate is increasing
D) Percentage growth rate is constant
72. Hardy-Cross Method consists of assuming a distribution of flow in the network in such a way that
- A) The principle of continuity is satisfied at each joint
B) The principle of continuity is satisfied at each junction
C) There can be discontinuity in pressure
D) There can be discontinuity in velocity

102/21

73. In Slow Sand Filters the effective size of filter sand ranges between
- A) 4 to 4.75 mm
 - B) 2 to 4 mm
 - C) 0.2 to 0.4 mm
 - D) 0.05 to 0.1 mm
74. The equalization tanks are provided
- A) To balance the head loss
 - B) For removing bigger suspended matter in sewage
 - C) To balance fluctuating flows or concentrations
 - D) None of the above
75. Which of the following is not a method for disinfection ?
- A) Boiling
 - B) Ozone treatment
 - C) Chlorination
 - D) Flocculation
76. Population equivalent is a measure of
- A) Population growth
 - B) Purity of water
 - C) Strength of sewage
 - D) None of the above
77. Aquatic life in a stream begin to be reduced as dissolved oxygen drops below
- A) 0.4 mg/l
 - B) 4 mg/l
 - C) 10 mg/l
 - D) 12 mg/l
78. Capacity of a primary settling tank to treat a sewage of 12 million litres per day, by assuming a detention period of 2 hours is
- A) 200 m³
 - B) 100 m³
 - C) 2000 m³
 - D) 1000 m³
79. In an Imhoff tank, the incoming sewage is
- A) Allowed to mix with settled sludge
 - B) Not allowed to mix with settled sludge
 - C) Allowed to mix with activated sludge
 - D) Not allowed to mix with activated sludge

A

80. In an upflow anaerobic sludge blanket reactor, the ratio of reactor volume (V) to flow rate (Q) is called
- A) Hydraulic Retention Time B) Solid Retention Time
C) Sludge Retention Time D) Blanket Retention Time
81. Determine the coefficient of permeability of soil (mm/s) in a constant head permeability test, in which the distance between piezometer tapings is 120 mm, area of the test sample is 100 mm² and the difference of water levels in the piezometers is 60 mm. 600 ml of water is collected in 300 seconds during the test.
- A) 0.01 B) 0.04 C) 0.06 D) 0.09
82. Find the effective stress at the bottom of a sand deposit of thickness 8 m. Water table is at the middle of the sand deposit. Take $\gamma = 18 \text{ kN/m}^3$, $\gamma_{\text{sat}} = 20 \text{ kN/m}^3$, $\gamma_w = 10 \text{ kN/m}^3$.
- A) 152 B) 132 C) 112 D) 102
83. A clay layer 6 m thick is subjected to a pressure of 60 kN/m². If the layer has a double drainage and undergoes 50% consolidation in one year, determine the coefficient of consolidation in m²/year. Take $T_v = 0.196$.
- A) 1.764 B) 1.250 C) 0.112 D) 0.156
84. Taylor's stability charts are based on the total stresses using
- A) Bishop's method B) Friction circle method
C) $\phi = 0$ analysis D) None of the above
85. Curve joining points of equal stress intensity
- A) Isotones B) Isochrones
C) Isohyets D) Isobars
86. What is the intensity of vertical stress in kN/m² below a point load of 500 kN at a depth of 5 m ?
- A) 8.54 B) 10.43 C) 9.55 D) 6.22
87. Determine the total lateral earth pressure at rest in kN on a retaining wall of height 5 m. Take $\gamma_{\text{soil}} = 17 \text{ kN/m}^3$ and $k_0 = 0.5$. Assume water table is below 5 m.
- A) 106.25 B) 110.54
C) 102.32 D) 115.12

Space for Rough Work