Booklet Series

A

22/AE/CM/M – 2024-05

Question Booklet

CIVIL ENGINEERING – I

Paper – V

Booklet Serial No.

Candidate's Roll Number

Time Allowed : 01 Hour

Maximum Marks : 100

Read the following instructions carefully before you begin to answer the questions.

IMPORTANT INSTRUCTIONS

1. This Question Booklet contains **50** questions in all.
2. **All** questions carry equal marks.
3. Attempt **all** questions.
4. An Answer Sheet has been supplied inside the question booklet to mark the answers. **You must write your Roll Number and encode it and write other particulars in the space provided in the Answer Sheet, failing which your Answer Sheet will not be evaluated.**
5. **Immediately after commencement of the examination, you should check up your Question Booklet and attached answer sheet and ensure that the Question Booklet Series is printed on the top left-hand corner of the Booklet and the series encoded in answer sheet are same. Also please check that the Booklet contains 12 printed pages including two pages (Page Nos. 11 and 12) for Rough Work and no page or question is missing or unprinted or torn or repeated or question booklet and answer sheet have different series. If you find any defect in this Booklet and attached answer sheet, get it replaced immediately by a complete Booklet with OMR sheet of the same series.**
6. You must write your Roll Number in the space provided on the top of this page. Do not write anything else on the Question Booklet.
7. Questions and their responses are printed in English version in this Booklet. Each question comprises of **four** responses — (A), (B), (C) and (D). You are to select ONLY ONE correct response and mark it in your Answer Sheet. In case you feel that there are more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each question. Your total marks will depend on the number of correct responses marked by you in the Answer Sheet.
8. In the Answer Sheet, there are **four** circles — (A), (B), (C) and (D) against each question. To answer the questions, you are to mark with **Black/Blue ink ballpoint pen ONLY ONE circle** of your choice for each question. Select only one response for each question and mark it in your Answer Sheet. If you mark more than one circle for one question, the answer will be treated as wrong. **Use Black/Blue ink ballpoint pen only to mark the answer in the Answer Sheet. Any erasure or change is not allowed.**
9. You should not remove or tear off any sheet from the Question Booklet. You are not allowed to take this Question Booklet and the Answer Sheet out of the Examination Hall during the examination. **After the examination has concluded, you must hand over your Answer Sheet to the Invigilator**. Thereafter, you are permitted to take away the Question Booklet with you.
10. Failure to comply with any of the above instructions will render you liable to such action or penalty as the Commission may decide at their discretion.
11. Candidates must assure before leaving the Examination Hall that their Answer Sheets will be kept in Self Adhesive LDPE Bag and completely packed/sealed in their presence.

A

1. To determine the modulus of rupture, the size of test specimen used is

(A) 150 × 150 × 200 mm

(B) 150 × 150 × 500 mm

(C) 150 × 150 × 100 mm

(D) 150 × 150 × 700 mm

2. For a base failure, the depth factor D_f is

(A) Zero

(B) $D_f > 1$

(C) 1

(D) None of the above

3. The design wind speed is assumed to be constant from the mean ground level upto a height of

(A) 10 m

(B) 20 m

(C) 8 m

(D) 4 m

4. The maximum energy stored at elastic limit of a material is called

(A) Modulus of resilience

(B) Proof resilience

(C) Bulk resilience

(D) Resilience

5. For economical spacing of roof truss, if t, p, r are the cost of truss, purlin and roof coverings respectively, then

(A) t = 3p + 2r

(B) t = 2p + r

(C) t = p + 3r

(D) t = p + 2r

6. According to Whitney's theory, depth of stress block for a balanced section of a concrete beam is limited to

(A) 0.637 d

(B) 0.537 d

(C) 0.75 d

(D) 0.8 d

7. In case of well foundation, grip length is defined as the

(A) Length between the bottoms of the well cap to the cutting edge

(B) Length below the top of the well cap to the cutting edge

(C) Depth of the bottom of the well below the minimum scour level

(D) Depth of the bottom of the well below the maximum scour level

8. The rate of consolidation

(A) Is independent of temperature

(B) Increases with decrease in temperature

(C) Increases with increase in temperature

(D) None of the above

9. A cantilever sheet pile derives its stability from

(A) Lateral resistance of soil

(B) Self weight

(C) The anchor rod

(D) None of the above

10. The shear lag effect in beam flanges are disregarded when the outstand of the beam flange is less than or equal to

(A) Lo/20

(B) Lo/10

(C) Lo/15

(D) Lo

11. The % of voids in cement is approximately

(A) 50%

(B) 40%

(C) 60%

(D) 80%

12. Coarse grained soils are the best compacted by a

(A) Drum roller

(B) Rubber tyred roller

(C) Vibratory roller

(D) Sheep's foot roller

13. Which of the following losses of pre-stress occurs only in pre-tensioning and not in post-tensioning ?

(A) Shrinkage of concrete

(B) Elastic shortening of concrete

(C) Creep of concrete

(D) Loss due to friction

14. If one end of a prismatic beam AB with fixed ends is given a transverse displacement (Δ) without rotation, then the moment induced at A or B due to the displacement is

(A) $EI\ \Delta/L^3$

(B) $12EI\ \Delta/L^2$

(C) $6EI\ \Delta/L^2$

(D) $12EI\ \Delta/L^3$

15. If the degree of saturation of a partially saturated soil is 60%, then the air content of the soil is

(A) 20%

(B) 80%

(C) 40%

(D) 60%

16. Eigen values of a square matrix are always

(A) Positive

(B) Real and imaginary

(C) Both negative and positive

(D) Negative

17. According to IS specifications, the minimum depth of foundation in sand and clay should be respectively

(A) 1000 mm and 800 mm

(B) 1000 mm and 1200 mm

(C) 700 mm and 900 mm

(D) 800 mm and 900 mm

18. The minimum cover to the ties or spirals should ***not*** be less than

(A) 20 mm

(B) 25 mm

(C) 15 mm

(D) 10 mm

19. If the building height greater than 50 m, but less than or equal to 250 m, then the building is known as

(A) Low rise building

(B) Medium rise building

(C) Super tall building

(D) Tall building

20. An example of a light moment connections is

(A) Clip angle section

(B) Framed connection

(C) Unstiffened seat connection

(D) Split beam connection

21. A continuous beam is deemed to be a deep beam when the ratio of effective Zspan to overall depth is less than

(A) 3.0

(B) 3.5

(C) 2.5

(D) 2.0

22. Lime stabilization is very effective in treating

(A) Non-cohesive

(B) Plastic clayey soil

(C) Sandy soil

(D) Silty soil

23. The fixed support in a real beam becomes in the conjugate beam as

(A) Hinged support

(B) Free support

(C) Fixed support

(D) Roller support

24. The effective length of a battened column is

(A) 25%

(B) 30%

(C) 20%

(D) Increased by 5%

25. When the plastic limit of a soil is greater than the liquid limit, then the plasticity index is reported as

(A) 1

(B) Zero

(C) Positive

(D) Negative

26. For a propped cantilever subjected to a point load at mid span, the value of collapse load is

(A) 4 Mp/L

(B) 12 Mp/L

(C) 8 Mp/L

(D) 6 Mp/L

27. Beam-columns are the structural members subjected to

(A) Axial tension and bending moment

(B) Axial compression and bending moment

(C) Bending moment and shear force

(D) All the above

28. The ratio of the undisturbed shear strength to the remoulded shear strength in cohesive soils under undrained conditions is

(A) Between 0 and 1

(B) 1

(C) Zero

(D) Greater than 1

29. The rotational stiffness coefficient K_{11} for the frame having two members of equal EI/L is given by

(A) 9 EI/L

(B) 7 EI/L

(C) 6 EI/L

(D) 8 EI/L

30. The upstream slope of an earth dam under steady seepage condition is

(A) Flow line

(B) Equipotential line

(C) Phreatic line

(D) Seepage line

31. The equation of a parabolic arch of span 'L' and central height h is given by

(A) $y = 3h \times (L - x)/L^2$

(B) $y = 8h \times (L - x)/L^2$

(C) $y = 4h \times (L - x)/L^2$

(D) $y = h \times (L - x)/L^2$

32. Inorganic soils with low compressibility are represented by

(A) SL

(B) MH

(C) ML

(D) CH

33. Shear strength of a soil is a unique function of

(A) Both effective and total stress

(B) Effective stress only

(C) Total stress only

(D) None of the above

34. In a two hinged parabolic an increase in temperature will

(A) make no change in the horizontal thrust

(B) decrease the horizontal thrust

(C) increase the horizontal thrust

(D) decrease the bending moment

35. A fully compensated raft foundation for a building is

(A) Designed as a very rigid raft

(B) Designed as a completely flexible raft

(C) Supported by piles of short length

(D) Such that the weight of the excavated soil is equal to the load due to the building

36. A continuous beam of constant Mp has three equal spans (L) and carries uniformly distributed load on each span. The value of collapse load for the beam will be

(A) 11.656 Mp/L

(B) 9.656 Mp/L

(C) 12 Mp/L

(D) 4 Mp/L

37. A load W is moving on a simply supported beam of span L from left to right. The maximum bending moment at 0.4L force left support is

(A) 0.2 WL

(B) 0.24 WL

(C) 0.16 WL

(D) 0.8 WL

38. The degree of freedom of a block type machine foundation is

(A) 3

(B) 2

(C) 4

(D) 6

39. A beam curved in plan is designed for

(A) Bending only

(B) Shear only

(C) Shear and torsion

(D) Bending moment, shear and torsion

40. In an internally indeterminate truss if the area of cross section of a redundant member is double

(A) The force in that member will not be affected

(B) The force in that member will be twice

(C) The force in that member will be halved

(D) The force in that member will be four times

41. The best tension member section will be a

(A) Welded single angle section

(B) Bolted angle section

(C) Double angle section on opposite side of gusset plate

(D) Channel section

42. Residual soils are formed by

(A) Wind

(B) Weathering of the parent rocks

(C) Glaciers

(D) Water

43. A fixed beam of span L is loaded with uniformly distributed load throughout the span. The contraflexure point will be at

(A) 0.25 L

(B) 0.30 L

(C) 0.21 L

(D) 0.15 L

44. For large span and heavy gravity loads, which of the following will be economical ?

(A) Truss

(B) Beam

(C) Arch

(D) Plate girder

45. For a linear elastic structural element

(A) Stiffness may not be correlated with flexibility

(B) Stiffness is directly proportional to the flexibility

(C) Stiffness is inversely proportional to the flexibility

(D) Stiffness is equal to flexibility

46. Total number of stress components at a point within a soil mass loaded at its boundary is

(A) 9

(B) 6

(C) 12

(D) 18

47. The purpose of reinforcement in pre-stressed concrete is

(A) To impart initial compressive stress in concrete

(B) To develop sufficient bond stress

(C) To resistance tensile stresses

(D) None of the above

48. If the strain energy absorbed in a cantilever beam in bending under its weight is X times greater than the strain energy absorbed in an identical simply supported beam in bending under its own weight, then the magnitude of X is

(A) 12

(B) 16

(C) 8

(D) 6

49. The slenderness ratio of lacing flats is limited to

(A) 145

(B) 110

(C) 225

(D) 350

50. A slab is designed as one way if the ratio of long span to short span is

(A) Between 2 and 3

(B) Greater than 3

(C) Greater than 2

(D) Between 1 and 1.5

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