02/AE/CME/2012-10

Serial No. 552250

Candidate's Roll Number

Question Booklet Series

B

Question Booklet

Paper—V

CIVIL ENGINEERING

Time Allowed : 1 Hour

SECTION—I

(Objective)

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. **Immediately after commencement of the examination, you should check up your Question Booklet and ensure that the Question Booklet Series is printed on the top right-hand corner of the Booklet. The Booklet contains 7 printed pages and no page or question is missing or unprinted or torn or repeated. If you find any defect in this booklet, get it replaced immediately by a complete booklet of the same series.**
5. 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.
6. An Answer Sheet will be supplied to you separately by the Invigilator to mark the answers. **You must write your Name, Roll No. and other particulars on the first page of the Answer Sheet provided, failing which your Answer Sheet will not be evaluated**
7. You will encode your **Roll Number** and the **Question Booklet Series A, B, C or D** as it is printed on the top right-hand corner of this Question Booklet with Black/Blue ballpoint pen in the space provided on **Page-2** of your Answer Sheet. **If you do not encode or fail to encode the correct series of your Question Booklet, your Answer Sheet will not be evaluated correctly.**
8. Questions and their responses are printed in English only in this Booklet. Each question comprises **four** responses—(A), (B), (C) and (D). You are to select ONLY ONE correct response and mark 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.
9. In the Answer Sheet, there are **four** brackets—(A), (B), (C) and (D) against each question. To answer the questions you are to **mark with Black/Blue ballpoint pen** ONLY ONE bracket of your choice for each question. Select one response for each question in the Question Booklet and mark in the Answer Sheet. If you mark more than one answer for one question, the answer will be treated as wrong. **Any erasure or change is not allowed.**
10. 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.
11. 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.

SEAL

1. For steel members exposed to weather and not accessible for repainting, the thickness of steel should not be less than
   (A) 4·5 mm
   (B) 6 mm
   (C) 8 mm
   (D) 10 mm

2. Limiting deflection for steel becomes supporting floor and false ceiling should be
   (A) span/600
   (B) span/500
   (C) span/325
   (D) span/200

3. At liquid limit, the
   (A) shear strength of soil is infinitesimal small
   (B) shear strength is infinity
   (C) soil is partially saturated
   (D) shear strength is considerable

4. Falling head permeability test is used for
   (A) sandy soil
   (B) clayey soil
   (C) silty sand
   (D) sandy gravel

5. Westergaard's theory is more suitable for
   (A) layered soil
   (B) homogenous soil
   (C) anisotropic soil
   (D) normally consolidated homogenous soil

6. Expansion of soil under shear is called
   (A) liquefaction
   (B) volumetric deformation
   (C) critical expansion
   (D) dilatancy

7. Most of the shear tests are done on equipment which are
   (A) stress-controlled
   (B) strain-controlled
   (C) drainage-controlled
   (D) volume-controlled

8. The maximum size of plate for plate load test is
   (A) 30 cm square
   (B) 45 cm square
   (C) 60 cm square
   (D) 75 cm square

9. Which of the following exhibits maximum deformation?
   (A) Local shear failure
   (B) General shear failure
   (C) Punching shear failure
   (D) Composite failure

10. Which one of the following planes is most likely to be the failure plane in sandy soils?
   (A) Plane carrying maximum shear stress
   (B) Plane carrying maximum normal stress
   (C) Plane with maximum angle of obliquity
   (D) Principal plane

11. In which
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11. In which one of the following pairs of soil types would you anticipate negative pore pressure when subjected to shearing?

(A) Normally consolidated clay and dense sand

(B) Overconsolidated clay and loose sand

(C) Less consolidated clay and overconsolidated clay

(D) Dense sand and over-consolidated clay

12. In a saturated clay layer consolidation with single drainage, the initial isochrone is a

(A) triangle

(B) square

(C) rectangle

(D) parabola

13. As per IS code, the frequency ratio (ratio of operating frequency of a machine to the natural frequency of soil) should not be within the range of

(A) 0·5 to 1·5

(B) 1·0 to 2·5

(C) 1·5 to 3·0

(D) 3·0 to 6·0

14. Under dynamic loading, the soil most likely to be affected is

(A) loose saturated clay

(B) loose saturated sand

(C) dense saturated sand

(D) loose saturated silt

15. Negative skin fiction on a pile under vertical compressive load acts

(A) downwards and increase the load-carrying capacity

(B) downwards and reduce the load-carrying capacity

(C) upwards and increase the load-carrying capacity

(D) upwards and reduce the load-carrying capacity

16. According to Skempton's formula for a surface floating of square shape, the net ultimate bearing capacity on a purely cohesive soil of cohesion 'C' is

(A) 1·4 C (B) 6·0 C

(C) 7·4 C (D) 9·0 C

17. Undisturbed soil samples are required for conducting

(A) hydrometer test

(B) shrinkage limit test

(C) consolidation test

(D) specific gravity test

18. In consolidation testing curve, fitting method is used to determine

(A) compression index

(B) swelling index

(C) coefficient of consolidation

(D) time factor

19. Mohr's circle is drawn for
   1. a point
   2. a square block
   3. a rectangular block
   4. isotropic material

   The correct answer is

   (A) 1, 2 and 4 (B) 2 and 4
   (C) 1 and 4 (D) 2, 3 and 4

20. In a plane stress problem
   1. normal stress in the third direction is zero
   2. strain in the third direction is zero
   3. strain in all directions is present
   4. normal stresses in all directions are present

   The correct answer is

   (A) 1 and 4 (B) 2 and 4
   (C) 1 and 3 (D) 2 and 3

21. Choose the correct statements from the following :
   1. Hooke's law is valid up to the limit of proportionality.
   2. Hooke's law is valid up to elastic limit.
   3. Limit of proportionality is always less than the elastic limit.
   4. Limit of proportionality is either equal to or less than the elastic limit.

   The correct answer is

   (A) 1 and 4 (B) 2 and 4
   (C) 1 and 3 (D) 2 and 3

22. A copper rod of square cross-section is fixed between two rigid supports and over which a steel rod of square cross-section is simply placed. If the temperature of the whole assembly is raised by T °C, the stresses in steel and copper respectively are
   (A) tensile and compressive
   (B) zero and compressive
   (C) compressive and tensile
   (D) compressive and zero

23. Choose the correct statements from the following :
   1. A stable and statically determinate real beam will have a stable and statically determinate conjugate beam.
   2. A statically indeterminate real beam will have unstable conjugate beam.
   3. A statically indeterminate conjugate beam is unstable real beam.

   The correct answer is

   (A) 1 and 3 (B) 2 and 3
   (C) 1 and 2 (D) 1, 2 and 3

24. A simply-supported beam of length l carries two equal unlike couples M at two ends. If the flexural rigidity EI = constant, then the central deflection of the beam is given by

   (A) $\frac{Ml^2}{4EI}$ (B) $\frac{Ml^2}{64EI}$
   (C) $\frac{Ml^2}{16EI}$ (D) $\frac{Ml^2}{8EI}$

25. The ordinates of influence line diagram for bending moment always have the dimensions of
(A) length
(B) force
(C) force/length
(D) force × length

26. Addition of pozzuolana to ordinary Portland cement increases
(A) bleeding
(B) shrinkage
(C) permeability
(D) heat of hydration

27. The development of strength of cement and its fineness are
(A) inversely proportional
(B) not related
(C) directly proportional
(D) randomly related

28. Which of the following pairs are correctly related for rapid hardening cement?
1. Fineness : 10%
2. Final setting time : 10 hours
3. Initial setting time : 30 minutes

The correct answer is
(A) 1, 2 and 3
(B) 1 and 2
(C) 2 and 3
(D) 1 and 3

29. The inclination of lacing bars with the axis of the compressive member should be more than
(A) 40° (B) 25°
(C) 60° (D) 70°

30. According to Tresca yield locus is
(A) a rectangle
(B) a hexagon
(C) an ellipse
(D) a circle

31. Load factor in plastic design depends upon
(A) nature of loading
(B) support conditions
(C) geometrical shape
(D) All of the above

32. For elastic design, the redistribution of moment in a continuous beam is limited to
(A) 10% (B) 15%
(C) 30% (D) 20%

33. The most economical section for a steel column is
(A) rectangle section
(B) solid section
(C) I-section
(D) tubular section

34. Degree of static indeterminacy of a rigid jointed plane frame having 15 members, 3 reaction components and 14 joints is
(A) 2 (B) 3
(C) 6 (D) 8

35. 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

36. The moment required to rotate the near end of a prismatic beam through a unit angle without translation, the far end being simply supported is given by
(A) $3EI / L$
(B) $4EI / L$
(C) $2EI / L$
(D) EI / L

37. The three-moment equation is applicable only, when
(A) the beam is prismatic
(B) there is no settlement of supports
(C) there is no discontinuity such as hinges within the span
(D) the spans are equal

38. The Muller-Breslau principle can be used to
1. determine the shape of the influence line
2. indicate the parts of the structure to be loaded to obtain the maximum effect
3. calculate the ordinates of the influence lines

The correct answer is
(A) 1 only
(B) Both 1 and 2
(C) 2 and 3
(D) 1, 2 and 3

39. For stable structures, one of the important properties of flexibility and stiffness matrices is that the elements on the main diagonal
1. must be positive of stiffness matrix
2. must be negative of stiffness matrix
3. must be positive of flexibility matrix
4. must be negative of flexibility matrix

The correct answer is
(A) 1 and 3
(B) 2 and 3
(C) 1 and 4
(D) 2 and 4

40. For limit state of collapse : flexure, the maximum strain in concrete at the outermost compression fibre is taken equal to
(A) 0·002 (B) 0·02
(C) 0·0035 (D) 0·035

41. In an RCC beam compression failure occurs in a/an
(A) balanced section
(B) overreinforced section
(C) underreinforced section
(D) None of the above

42. In a two-way spanning slab, if corners of the slab are not allowed to lift, torsion reinforcement is provided at corners in the form of a mesh. The size of mesh should be equal to
(A) $0 \cdot 125 l_x \times 0 \cdot 125 l_y$
(B) $0 \cdot 125 l_x \times 0 \cdot 25 l_y$
(C) $0 \cdot 25 l_x \times 0 \cdot 25 l_y$
(D) $0 \cdot 20 l_x \times 0 \cdot 20 l_y$

43. In an RCC slab, having effective depth equal to 100 mm maximum, spacing of main reinforcement should not be greater than
(A) 100 mm
(B) 200 mm
(C) 300 mm
(D) 400 mm

44. In a steel roof truss, if angle iron purlin is used, its depth should not be less than
(A) $\frac{1}{60} \times$ span of purlin
(B) $\frac{1}{45} \times$ span of purlin
(C) $\frac{1}{60} \times$ spacing of purlin
(D) $\frac{1}{45} \times$ spacing of purlin

45. Lateral stability of steel beam increases
(A) axial compressive stress in beam
(B) shear stress in beam
(C) bending tensile stress in beam
(D) bending compressive stress in beam

46. Distance between purlins on sloping roof depends on
(A) slope of truss
(B) type of truss
(C) type of roof coverings
(D) spacing of trusses

47. The strength of 'strut' depends on
(A) diameter of rivet used
(B) thickness of gusset plate
(C) net area of strut
(D) slenderness ratio of strut

48. When purlins are placed between panel points the principal rafter is to be designed for
(A) axial compression and tension
(B) axial compression
(C) axial compression and bending moment
(D) axial tension and bending moment

49. If diameter of reinforcement bar is d, the anchorage value of the hook alone will be
(A) $4d$
(B) $8d$
(C) $12d$
(D) $16d$

50. Web crippling generally occurs at the point, where
(A) deflection is maximum
(B) shearing stress is maximum
(C) bending stress is maximum
(D) concentrated load acts

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