28/AE/CME/M–2022–5

Booklet Series

Candidate's Roll Number

D

Serial No. 400582

Question Booklet

Paper—V

CIVIL ENGINEERING

Time Allowed : 1 Hour	**(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 8 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. If grades of steel and concrete are respectively Fe 415 and M 20 in a beam reinforced in tension side with 4–20 T and of width 30 cm and having effective depth 55 cm, then the depth of neutral axis of the section is

(A) 109·9 mm

(B) 209·9 mm

(C) 309·9 mm

(D) None of the above

2. The doubly reinforced section having $d = 600$ mm, reinforced with 6–25 T at bottom and 4–20 T at top, $b = 350$ mm, $d' = 60$ mm, Fe 415 steel grade and M 20 grade is

(A) underreinforced

(B) overreinforced

(C) balanced

(D) None of the above

3. The effective width of the simply supported flanged beam with $D_f = 100$ mm, $l_0 = 12000$ mm, $b_w = 350$ mm having $d = 500$ mm, Fe 415 steel grade and M 20 grade is

(A) 1990 mm

(B) 1950 mm

(C) 2590 mm

(D) 2950 mm

4. A three-hinged arch is statically

(A) determinate structure

(B) indeterminate structure

(C) unstable structure

(D) None of the above

5. A fillet weld may be termed as

(A) mitre weld

(B) concave weld

(C) convex weld

(D) All of the above

6. Which of the following sections should preferably be used at places where torsion occurs?

(A) Angle section

(B) Channel section

(C) Box-type section

(D) Any of the above

7. The effective length of a fillet weld should not be less than

(A) four times the weld size

(B) six times the weld size

(C) the weld size

(D) two times the weld size

8. Generally, the purlins are placed at the panel points so as to avoid

(A) shear force in rafter

(B) deflection of rafter

(C) bending moment in rafter

(D) axial force in rafter

9. IS : 800–2007 limits the values of width to thickness ratios of the elements of a steel section to place a check on

(A) torsional buckling

(B) flexural-torsional buckling

(C) bending buckling

(D) local buckling

10. The design wind depends upon
(A) risk coefficient
(B) topography of the area
(C) size of the structure
(D) All of the above

11. A steel plate is 30 cm wide and 10 mm thick. If the diameter of the bolt hole is 20 mm, then the net section area of the plate is
(A) 2800 mm^2
(B) 2080 mm^2
(C) 1850 mm^2
(D) 1800 mm^2

12. The thickness of gusset plate should not be less than
(A) 5 mm
(B) 12 mm
(C) 6 mm
(D) None of the above

13. A beam fixed at the ends and subjected to lateral loads only is statically indeterminate and the degree of indeterminacy is
(A) 2
(B) 3
(C) 4
(D) 1

14. The influence line for maximum bending moment in a simply supported beam is
(A) parabolic
(B) irregular
(C) triangular
(D) rectangular

15. A fixed beam of span L is subjected to a moment M at the centre of span. The fixed end moment is
(A) $M/4$
(B) $M/3$
(C) M
(D) $M/2$

16. A fully saturated soil is set to the
(A) two-phase system with soil and water
(B) two-phase system with soil and air
(C) three-phase system
(D) one-phase system

17. If the uniformity coefficient $C_u = 4$ and coefficient of curvature $C_c = 1$ for a soil, then D_{30} / D_{10} for the soil is
(A) $\frac{1}{4}$
(B) 2
(C) 4
(D) $\frac{1}{2}$

18. If the volume of voids is equal to the volume of the solids in a soil mass, then the values of porosity and voids ratio respectively are
(A) 1·0 and 0·0
(B) 0·0 and 1·0
(C) 1·0 and 0·5
(D) 0·5 and 1·0

19. For a piping phenomenon to occur in soil, the most important condition to be satisfied is that

(A) wide ratio is more than 2

(B) specific gravity of soil solids is more than 2·8

(C) hydraulic gradient is nearly unity

(D) soil is fine grained

20. Time factor for a clay layer is

(A) a dimensionless perimeter

(B) directly proportional to permeability of soil

(C) inversely proportional to drainage path

(D) independent of thickness of clay layer

21. In the consolidated drain test on a saturated soil sample, pour water pressure is zero during

(A) loading stage

(B) shearing stage only

(C) both consolidation and shearing stages

(D) consolidation stage only

22. When the degree of consolidation is 50%, the time factor is about

(A) 1·0

(B) 0·5

(C) 0·2

(D) 2·0

23. Undisturbed soil samples are required for conducting

(A) hydrometer test

(B) consolidation test

(C) shrinkage limit test

(D) specific gravity test

24. Deflection of a sheet pile in a braced cut

(A) increases from the top and then decreases

(B) decreases from the top to the bottom

(C) decreases from the top and then increases

(D) increases from the top to the bottom

25. Lacustrine soils are soils

(A) deposited in seabeds

(B) transported by glaciers

(C) transported by rivers and streams

(D) deposited in lake beds

26. Skempton's pore pressure coefficient B for saturated soil is

(A) 1

(B) between 0 and 1

(C) greater than 1

(D) zero

27. Which one of the following parameters can be used to estimate the angle of internal friction of a sandy soil?

(A) Roughness of particles

(B) Particle size

(C) Particle size distribution

(D) Density index

28. A cantilever sheet pile derives its stability from

(A) lateral resistance of soil

(B) the anchor rod

(C) the deadman

(D) self-weight

29. A sand deposit has a porosity of $\frac{1}{3}$ and its specific gravity is 2·5. The critical hydraulic gradient to cause sand boiling in the stratum will be

(A) 1·0

(B) 1·25

(C) 1·5

(D) 0·75

30. Rafts resting on sands can be allowed double of the allowable soil pressure when

(A) length is doubled

(B) depth factor is increased

(C) water table is lowered

(D) permissible settlement is doubled

31. In standard penetration test, the split spoon sampler is penetrated into the soil stratum by giving blows from a drop weight whose weight (in kg) and free fall (in cm) are respectively

(A) 60 and 30

(B) 65 and 75

(C) 75 and 65

(D) 30 and 60

32. In Mohr's diagram, a point above Mohr's envelope indicates

(A) imaginary condition

(B) imminent failure condition

(C) condition of maximum obliquity

(D) safe condition

33. In plate load test, pre-loading recommended by IS code is

(A) 100 gm/cm^2

(B) 120 gm/cm^2

(C) 125 gm/cm^2

(D) 70 gm/cm^2

34. According to IS code, the permissible values of settlement in clay and sand are respectively

(A) 40 mm and 20 mm

(B) 30 mm and 60 mm

(C) 60 mm and 30 mm

(D) 20 mm and 40 mm

35. The value of factor of safety adopted in foundation design is

(A) 1·5 to 2·0

(B) 2·0 to 3·0

(C) 3·0 to 4·0

(D) 1·2 to 1·5

36. A rectangular bar of width b and height h is being used as a cantilever. The loading is in a plane parallel to the side b. The section modulus is

(A) $bh^3/12$

(B) $bh^2/6$

(C) $hb^2/6$

(D) None of the above

37. The number of plastic hinges required for collapse of structures with degree of indeterminacy n is

(A) n

(B) $(n+1)$

(C) 0

(D) $(n-1)$

38. The shape factor for a circular tubular section with outside diameter equal to twice the inner diameter is

(A) 1·75

(B) 2·0

(C) 2·5

(D) 1·58

39. A beam of length L is pinned at both ends and is subjected to a concentrated bending couple of moment M at its centre. The maximum bending moment in the beam is

(A) $M/2$

(B) ML

(C) $ML/2$

(D) M

40. For a simply supported beam of length L, the bending moment M is described as $M = a(x - x^3/L^2)$, $0 \le x < L$; where a is a constant. The shear force will be zero at

(A) mid-span

(B) supports

(C) $L^2/\sqrt{3}$

(D) None of the above

41. If we use a link support in a structural system, then how many unknowns would we have?

(A) 0

(B) 1

(C) 2

(D) None of the above

42. If a member of a truss is in compression, then what will be the direction of force that it will apply to the joints?

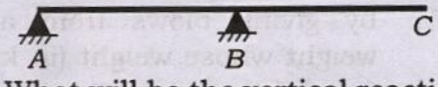
(A) Inward

(B) Depends on case

(C) No force will be there

(D) Outward

43. Assume $AB = BC = 1$ m for the following beam :



What will be the vertical reaction at point B?

(A) $1 - X$

(B) X

(C) $X - L$

(D) 0

44. If we require constructing ILD of vertical support at a pin joint, then according to Muller-Breslau principle, by which type of support should it be replaced?

(A) Pin roller

(B) Fixed support

(C) Hinge

(D) Roller guide

45. Which structure will perform better during earthquake?

(A) Statically indeterminate

(B) Both statically determinate and statically indeterminate

(C) Depends upon magnitude of earthquake

(D) Statically determinate

46. If support *B* settles by 1 mm downward, then what is the direction of rotation at point *A*?

(A) Anticlockwise

(B) Cannot say

(C) Depends upon loading at point *A*

(D) Clockwise

47. The transverse reinforcements provided at right angles to the main reinforcement

(A) distribute the load

(B) resist the temperature stresses

(C) resist the shrinkage stress

(D) All of the above

48. After pre-stressing process is completed, a loss of stress is due to

(A) shrinkage of concrete

(B) elastic shortening of concrete

(C) creep of concrete

(D) All of the above

49. The spacing of transverse reinforcement of column is decided by which of the following considerations?

(A) The least lateral dimension of the column

(B) Sixteen times the diameter of the smallest longitudinal reinforcing rods in the column

(C) Forty-eight times the diameter of the transverse reinforcement

(D) All of the above

50. Lapped splices in tensile reinforcement are generally not used for bars of size larger than

(A) 30 mm diameter

(B) 24 mm diameter

(C) 18 mm diameter

(D) 36 mm diameter

SPACE FOR ROUGH WORK

SEAL

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