Paper–V

CIVIL ENGINEERING (Paper-I)
(Section-I)

Time Allowed : 1 Hour   (Objective)   Maximum Marks : 100

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

Important Instruction

1. The 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 HB Pencil in the space provided on the Page - 2 of your Answer Sheet. If you do not encode or fail to encode the correct series of your Questions Booklet, your answer sheet will not be evaluated correctiy.

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 HB Pencil ONLY ONE bracket of you 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. In case, you want to change any answer in the Answer Sheet, you should first erase the pencil mark clearly, thereafter mark the answer of your choice. Use HB Pencil only to mark the answer in the Answer Sheet.

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.

1. Spacing of the vertical stiffener in plate girder shall be :
   (A) not greater than d nor less than 0.25d
   (B) not greater than 2d nor less than 0.25d
   (C) not greater than 1.5d nor less than 0.33d
   (D) not greater than 1.2d nor less than 0.33d

2. Uplift capacity of pile is determined by :
   (A) End bearing
   (B) Skin friction
   (C) End bearing and skin friction
   (D) None of the above

3. A long column of length 'L' and flexural rigidity 'EI' has pinned ends, The critical load is given by :
   (A) $\frac{4\pi^2 EI}{L^2}$ (B) $\frac{\pi^2 EI}{4L^2}$ (C) $\frac{4L^2}{\pi^2 EI}$ (D) $\frac{\pi^2 EI}{L^2}$

4. Among the materials mentioned below the pronounced yield point is the characteristic of :
   (A) Cast-iron   (B) Structural steel
   (C) Concrete   (D) Stone

5. The methods of slices is applicable to:
   (A) Stratified soils   (B) Homogeneous soils
   (C) Saturated soils   (D) None of these

6. Stiffness approach of solution of indeterminate structures intends to solve for
   (A) unknown force   (B) unknown action
   (C) unknown displacements
   (D) none of the above

7. If a prismatic bar of cross section = A is subjected to a tensile force = P, the shear stress on a plane inclined at an angle 45° with the axis is given by:
   (A) $\frac{1}{2}P / A$ (B) $\frac{3}{2}P / A$ (C) $\frac{2}{3}P / A$ (D) 2P/A

8. The minimum number of longitudinal bars provided in a circular column is:
   (A) Six   (B) Four
   (C) Eight
   (D) Depends on size of column

9. An important assumption in the derivation of the equation M/I = F/Y = E/R (notions have their usual meaning) for a beam cross section under flexure is:
   (A) Neutral axis passes through its centroid
   (B) Neutral axis lies above the centroid
   (C) Neutral axis lies below the centroid
   (D) None of the above

10. Where a member is built into a masonry wall which develops only partial restraint, the member shall be designed to resist 'a moment at the face of the support of :
   (A) $\frac{WL}{12}$ (B) $\frac{WL}{10}$ (C) $\frac{WL}{48}$ (D) $\frac{WL}{24}$

Where W = Total design load and L = Effective span.

11. The value of maximum slenderness ratio of a member (structural steel section) carrying compressive loads resulting from dead load and imposed loads shall be:
    (A) 300   (B) 180   (C) 150   (D) 250

12. The yield of a retaining wall required to reach. failure is :
    (A) More for the active state
    (B) More for the passive state
    (C) Equal for both active and passive
    (D) No yield necessary

13. When assessing the strength of a structural member for the limit state of collapse, the values of partial safety factor γ_m for material strength should be :
    (A) 1.5 for concrete and 1.15 for steel
    (B) 1.15 for concrete and 1.5 for steel
    (C) 1.2 for both concrete and steel
    (D) 1.5 for both concrete and steel

14. For an element under biaxial stress the sum of complementary normal stresses are
    (A) Equal to maximum shear stress
    (B) Half of the maximum shear stress
    (C) Always constant
    (D) Sometime constant

15. The value of Poission's ratio of cork is approximately equal to:
    (A) 1   (B) 0.50
    (C) 0.1   (D) Zero

16. Negative skin friction on piles may occur when
    (A) The soil is undrained
    (B) The residual strength of soil is high
    (C) There is constant seepage through the soil adjacent to pile
    (D) The fill has consolidated around the pile after driving

17. The maximum permissible bearing stress in any part of the beam when calculated on the net area of contact shall not exceed
    (A) 0.50 fy   (B) 0.85 fy
    (C) 0.75 fy   (D) 0.25 fy

18. In an element the complimentary sheer stresses are always :
    (A) Equal in sign
    (B) Equal in both magnitude and sign
    (C) Equal in magnitude but opposite in sign
    (D) None of the above

19. A basement raft of 12m square is placed at a depth of 3m below ground level in a depoit of silty clay having C = 4t / m², ϕ = 0. γ = 2 t/m³ and water table at ground level with a factor of safety 3, the approximate net bearing pressure is :

(A) 14 t/m²   (B) 8 t/m²

(C) 11 t/m²   (D) 10 t/m²

20. Maximum spacing of shear reinforcement measured along the axis of the member for vertical shear shall not exceed the lesser of :

(A) 0.85d and 200 m   (B) 0.50d and 300 mm

(C) 0.75d and 350 mm   (D) 0.75d and 450 mm

21. The shear strength in plastic undrained clay results from :

(A) internal friction   (B) Cohesion

(C) Intergrannular fiction   (D) none of these

22. An element submitted to the action of biaxial stress

(A) $\sigma_x = 2\sigma_y$ (B) $\sigma_x = \sigma_y$

(C) $2\sigma_x = \sigma_y$ (D) $\sigma_x = -\sigma_y$

23. If pile foundation is adopted in an expansive soil deposit, then the most suitable type of pile is :

(A) Straight shaft driven pile

(B) Uniform diameter bored pile

(C) Multiple bulb under-reamed pile

(D) Cast-iron H-pile.

24. The angle of inclination of lacing bars (double or single) with respect to the axis of the stanchion shall be :

(A) not less than 30° nor more than 60°

(B) not less than 25° nor more than 50°

(C) not less than 45° nor more than 80°

(D) not less than 40° nor more than 70°

25. The greatest amount of strain energy per unit volume that a material can absorb without exceeding its proportional limit is known as :

(A) Modulus of resilience   (B) Modulus of rigidity

(C) Shear Modulus   (D) Toughness

26. Consideration of both shallow and deep foundation depends:

(A) Only on depth to width ratio

(B) Only on the predominant structural action

(C) Both of the above   (D) None of the above

27. At shrinkage limit :

(A) Soil is dry   (B) Soil is partly saturated

(C) Soil is fully saturated   (D) None of the above\

28. Point of contraflexure is a point in the beam where :

(A) Shear force is zero   (B) Shear force is maximum

(C) Bending moment is zero

(D) Bending moment changes its sign

29. The depth of scour is normally measured from :

(A) High flood level   (B) Mean water level

(C) Ground level   (D) None of the above

30. In hydrated cement paste, the principal strength contributing component is:

(A) Tricalcium hydrate

(B) Calcium silicate hydrate

(C) Calcium hydroxide

(D) Tricalcium aluminate hydrate

31. Nature of bending moment of a simply supported beam loaded with triangular load is :

(A) Triangular   (B) Square parabola

(C) Cubic parabola   (D) None of the above

32. Stokes' law does not hold good if the size of particle is greater than :

(A) 0.2 mm   (B) 0.02 mm

(C) 0.0002 mm   (D) 0.002 mm

33. Area of the side face reinforcement of a beam where the depth of web exceeds 750 mm shall be not less than :

(A) 0.25% of web area   (B) 0.15% of web area

(C) 0.10% of web area   (D) 0.8% of web area

34. A continuous beam 8M long simply supported over two spans 4m long each carries a udl of 10 kN/m run over its entire length. The support moment at the central support is :

(A) 20kNm   (B) 30kNm

(D) 40kN m   (D) 45kNm

35. When a prismatic steel bar is subjected to axially applied tensile force, the total tension in the bar is called :

(A) Axial resultant   (B) Reactive force

(C) Stress resultant   (D) Normal stress

36. In design of foundation the soil is loaded with a factor of safety on bearing capacity to ensure :

(A) The soil behaviour to be elastic at working load

(B) The soil parameters are not precisely known

(C) The soil is elasto-plastic

(D) None of the above

37. When the effect of the wind or earthquake load is taken a account, the permissible stresses specified for Rivets, bolts and tension rods may be exceeded by

(A) $33\frac{1}{3}$ percent   (B) 25 percent

(C) 15 percent   (D) 1.5 times normal value

38. The maximum diameter of reinforcing bars in a slab shall not exceed :

(A) $\frac{1}{4}$ th of the total slab thickness

(B) $\frac{1}{8}$th of the total slab thickness

(C) $\frac{1}{4}$th of effective slab thickness

(D) $\frac{1}{8}$th of effective slab thickness

39. The maximum grade of reinforced concrete in sea-water or exposed directly along the sea coast shell be at least :

   (A) M 10   (B) M 15   (C) M 20   (D) M 25

40. The floating foundation is one in which

   (A) The foundation floats in water

   (B) The super structure rest on a number of free standing piles

   (C) The foundation consists of cellular raft

   (D) The net soil pressure is beneath the foundation structure is zero

41. During tensile test of a flat bar of low carbon steel with polished surfaces, the Leuder's lines on the flat sides of the specimen indicate that the failure is due to :

   (A) Shear   (B) Torsion

   (C) Direct Tension   (D) Rupture

42. A cantilever beam of span 'L' subjected to a concentrated load 'P' at mid span. The bending moment at free end is equal to :

   (A) PL/2   (B) PL/4

   (C) PL   (D) Zero

43. Water formed transported soils are termed as :

   (A) Alluvial   (B) Aeoline

   (C) Colluvial (D) Cumulose

44. In flat slab design, the critical section for shear shall be considered from the periphery of the column/capital/drop panel, perpendicular to the plane of the slab at a distance :

   (A) d   (B) 2d

   (C) d/2

   (D) 1.5d where d = Effective depth of slab section

45. The peak ordinate of Infuence line diagram for bending moment at 'a' from left support of a simply supported beam; of span 'L' is given by :

   (A) aL   (B) $\frac{L(a-L)}{a}$

   (C) $\frac{a(L-a)}{a}$ (D) $\frac{a(L-a)}{L}$

46. Shear failure indicates :

   (A) lateral-displacement of soil

   (B) Upward displacement of soil

   (C) Both lateral and upward displacement

   (D) None of these

47. If b = breadth of the beam, d = effective depth and fy = Characteristic strength in N/mm^2. Minimum area of tension reinforcement shall not be less than the following :

   (A) $\frac{0.75\,bd}{fy}$ (B) $\frac{0.85\,bd}{fy}$

   (C) $\frac{0.85\,fy}{bd}$ (D) $\frac{0.75\,fy}{bd}$

48. A fixed beam of length L is subjected to a bending moment M at its centre. The fixing couple at the ends are :

   (A) M   (B) $\frac{3}{4}$M

   (C) M/2   (D) M/4

49. The thickness of edge of reinforce concrete and plain concrete footings on piles shall be not less than :

   (A) 200 mm   (B) 250 mm

   (C) 150 mm   (D) 300 mm

50. The property of a material by which it returns partially or completely to its initial shape after unloading is called :

   (A) Plasticity   (B) Ductility

   (C) Strain hardening   (D) Elasticity