Register No.: [ ]

367

April 2023

Time – Three hours
(Maximum Marks: 100)

N.B.
1. Answer all questions under Part-A. Each question carries 3 marks.
2. Answer all the questions either (A) or (B) in Part-B. Each question carries 14 marks.
3. Use of IS 456, IS 800 code books, Steel tables, Structural Engineering hand book and permitted.
4. Assume suitable data, if necessary.

PART – A

1. What is the necessity of providing reinforcement in concrete?
2. Differentiate between Singly reinforced section and Doubly reinforced sections.
3. Define Nominal shear stress.
4. Write the advantages of T-beam.
5. State the necessities for providing distribution steel in slab.
6. Classify the stairs based on their structural behaviour and geometry.
7. Write the minimum diameter and maximum spacing of longitudinal bar in a RCC column.
8. Mention minimum area of reinforcement and minimum cover for footings.
9. Define effective sectional area of compression member.
10. State the formula for shear strength of a laterally supported steel beam.

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PART – B

11. (a) A singly reinforced simply supported beam 230 mm wide and 460 mm effective depth is reinforced with 3 bars of 20 mm dia. bars in tension zone. Determine the maximum characteristics load the beam can carry (inclusive of self weight) on an effective span of 5 m at the limit state of collapse in flexure. Use M20 and Fe 415.

(Or)

(b) Find the A_{st} and A_{sc} of a doubly reinforced rectangular beam of 300 mm wide and 500 mm deep (effective) subjected to an ultimate moment (factored moment) of 180 kN-m. Use M20 and Fe 415.

12. (a) A simply supported R.C rectangular beam of 250mm x 510mm overall size carries an u.d.l of 12.5kN/m(inclusive of its self weight) over an effective span of 5.5m. It is reinforced with 3 numbers of 20 mm dia. mild steel bars in tension with a clear cover of 25mm throughout its length. The concrete is of M20 grade. Design the shear reinforcement in the form of vertical stirrups for the maximum shear force using 6mm dia mild steel bars.

(Or)

(b) A 'T' beam section has a flange of 1280 mm x 100 mm, effective depth of 700 mm and breadth of web of 280 mm. It is reinforced with 5 nos. of 25 mm dia Fe 415 grade steel bars in the tension zone. M20 grade concrete is used. Determine the moment of resistance of the section at the limit state of collapse.

13. (a) Design a one-way floor slab with a clear span of 3.6m simply supported on 230mm thick masonry walls to support a live load of 3kN/m² and a floor finish of 1kN/m². Use M20 grade concrete and Fe 415 grade steel.

(Or)

(b) Design the corner panel of a continuous two way slab of clear dimensions 4m x 5m using M20 grade concrete and mild steel. The support width is 250 mm. The imposed load is 3kN/m²

14. (a) Design a square R.C footing of uniform thickness for a R.C. Column of 400mm x 400mm size, carrying an axial load of 1200 kN, using M20 grade concrete and Fe 250 grade mild steel reinforcement. The safe bearing capacity is 150 kN/m².

(Or)

(b) Design a circular column with helical reinforcement to carry an axial load of 1200kN. Use concrete grade M25 and steel grade Fe415. The effective length of the column is 3m.

15. (a) Design a single angle strut connected to the gusset plate to carry 150 kN factored load. The length of the strut between centre to centre intersection is 3 m.

(Or)

(b) A cantilever beam of 3m effective span carries a design load of 30 kN/m inclusive of its self weight. Design the beam using double channels of yield stress 350 Mpa. Check for deflection not necessary.
