Register No.:

1993

October 2024

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, Structural Engineering Handbook and Steel Tables approved by the Board are permitted.
4. Assume suitable data, if necessary.]

PART – A

1. What is meant by grade of concrete? Write any two grades of concrete.
2. Mention the advantages of limit state method.
3. Mention the types of shear reinforcement with sketches.
4. Write the maximum shear stress value for M20, M30 and M40 grades of concrete.
5. Write the types of staircases with sketches.
6. What is meant by one-way slab?
7. Define effective length of column.
8. Write the procedure for checking one-way shear for an isolated footing.
9. List the classifications of steel beams.
10. Mention the different types of weld.

PART – B

11. (a) A reinforced concrete simply supported beam of size 300mm x 450mm (effective) when M20 grade concrete and Fe415 grade steel are used. Determine the area of tension steel required for a balanced section. Also find the limiting value of ultimate moment of resistance of the section.

(Or)

[Turn over.....

(b) The cross section of the beam is 230 mm x 500 mm (effective) subjected to a bending moment of 80 kNm. It is reinforced with 4 nos. of 16 mm diameter bars as tension reinforcement. M20 grade concrete and Fe 415 grade steel are used. State whether the section is safe or not.

12. (a) A simply supported T-beam of clear span 6m carries an UDL of 30kN/m excluding self-weight. Design the mid span section using M25 concrete and Fe415 steel. Assume the width of support as 300mm.

(Or)

(b) A simply supported rectangular beam has an effective depth of 600mm and breadth of 300mm. The beam is reinforced with 3 bars of 20mm as tension reinforcement at the support. The beam is subjected to a factored shear force of 180kN at the support. Check the shear stress and design shear reinforcement. M20 grade concrete and Fe 250 steel are used. Use 8mm diameter 2 legged stirrups of Fe 415.

13. (a) Design a roof slab for a pump house of size 3.0m x 4.0m (effective span). The slab is supported on all its four sides by 230mm wall thickness. The edges of the slab are discontinuous and the corners are prevented from lifting. Access is to be provided to the roof. The weight of weathering course over the slab is 2 kN/m^2. Use M20 grade concrete and Fe 415 grade steel.

(Or)

(b) Design the flight slab for a room 2.5m x 4.5m. The live load of 5.0 kN/m^2. Tread is 250mm and Rise is 160mm. Steps are of reinforced concrete. M20 and Fe415 are to be used. Landing slab and flight slab span in same direction. Height of floor is 3.2m.

14. (a) Design a square R.C. Column to carry an axial load of 1300 kN. Take f_{ck} =20 MPa, f_y = 415 MPa. The unsupported length of the column is 4m. The ends of the column are effectively held in position but not restrained against rotation.

(Or)

(b) A R.C circular column of 300mm diameter, carrying an axial load of 400 kN is to be provided with a square footing at uniform thickness on a soil of safe bearing capacity 150 kN/m^2. Concrete grade M25 and steel grade Fe415 are to be used. Determine the size of footing and the thickness of footing required for the limit state of collapse in flexure.

15. (a) Design a suitable section for a compression member of effective length 4m to carry an axial load of 700kN using a single rolled heavy I-section of yield stress 400MPa.

(Or)

(b) Explain the step by step procedure for design of welded connection for an angle section.
