D 90231 (Pages : 2) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, NOVEMBER 2015

CE/PTCE 09 701—STRUCTURAL DESIGN–III

Time : Three Hours Maximum : 70 Marks

Use of IS 3370 (Part 1 to 4), IRC 21, IS 13473, IS 800, IS 456 SP6, SP16, Steel tables are permitted.
Assume any missing data suitably.

Part A

Answer **all** *questions.*

1. Under what condition will the effective length be infinity and what is the meaning of this condition ?
2. Having determined the area of the footing, should we use factored load or the service load for the design of the RCC footing ? Then how will the soil reaction from below compare with the safe bearing capacity ?
3. State the basic philosophy governing the design of bridge structures.
4. Differentiate between pre-tensioning and post tensioning.
5. List out the important properties of structural steel.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Explain how bracing can be provided for columns in multistoried buildings.
7. Sketch the details of reinforcement for a pile cap, indicating the different shapes of reinforcements that will be incorporated in the pile cap.
8. Explain the effect of water in backfill on the active earth pressure on a retaining wall.
9. Discuss the procedure for design of staging for water tanks.
10. Explain with sketches Freyssinet system of post tensioning.
11. Discuss the advantages and disadvantages of riveted connections and bolted connections.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*

12. Design a RCC column of size 250 mm × 400 mm, subject to a factored load of 1500 kN. The column has an unsupported length of 6.5 m. Use M20 concrete and Fe 415 grade steel.

Or

13. Design a RCC sloped footing for a short axial column of size 300 mm × 300 mm, carrying 600 kN load at service. The safe bearing capacity of the soil is 180 kN/m^2. Use M20 concrete and Fe 415 grade steel.

14. Design the stem of a cantilever retaining wall to retain earth embankment 3.75 m high above ground level. The density of the earth is 19 kN/m^3 and its angle of internal of friction is 30°. The embankment is horizontal at the top. The safe bearing capacity of the soil is 180 kN/m^2 and the coefficient of friction between the soil and concrete is 0.5. Adopt M20 concrete and Fe 415 grade steel.

Or

15. Design a rectangular water tank of size 6 m × 4 m × 3 m deep resting on the ground. Use M25 concrete and Fe 415 grade steel. Assume the tank is open at the top.

16. A prestressed beam 500 mm × 700 mm has a simple span of 7 m and is loaded with a uniformly distributed load of 15 kN/m including its own weight. The prestressing tendon is located at 200 mm from the bottom face. The effective prestress introduced through the tendons is 2500 kN. Calculate the extreme fibre stresses in the concrete at the mid-span due to the above load effects.

Or

17. A pretensioned concrete member 300 mm × 250 mm is prestressed using 9 wires of 7 mm diameter. Four wires are located at top and five wires at the soffit of the beam with an effective cover of 40 mm. The initial stress in the wire is 1200 N/mm^2. Assuming the modular ratio as 6, estimate the percentage loss of stress due to elastic deformation when all the top and bottom wires are stressed simultaneously.

18. Design a laterally supported steel beam of effective span of 6 m. Factored bending moment in the beam is 150 kNm and factored shear force is 200 kN. Check for shear, web buckling and bearing.

Or

19. A plate girder is subjected to a maximum factored moment of 4000 kNm and a factored shear force of 600 kN. design the section with end as well as intermediate transverse stiffeners.

(4 × 10 = 40 marks)