D 11923 (Pages : 3) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, NOVEMBER 2016

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 table permitted.
Assume any missing data suitably.

Part A

Answer **all** *questions.*

1. What is meant by slenderness ratio of a compression member ?
2. What are the situations in which combined footings are preferred to isolated footings ?
3. Whatare the forces act on the conical dome ?
4. List the various types of losses of prestress in Prestress concrete beams and their corresponding equations.
5. What is plate girder ? Where it is used ? Name its various components.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. Explain the reduction factor method for design of slender columns. Under what conditions is the method specified to be used in IS code ?
7. Explain the conditions in which transfer of forces at the interface of pedestal and footing can be achieved without the aid of reinforcement.
8. Discuss the behaviour of various elements of a counter fort retaining walls.
9. Explain the design procedure of spherical domes.
10. Explain the necessity of high strength steel and concrete in prestressed concrete member.
11. Discuss the advantages and disadvantages of welded connections in steel members.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*

12. Design the longitudinal reinforcement for a braced slender column 500 mm × 400 mm in section for a factored axial load of 2500 kN. The factored moments at the top are M_{xx} = 150 kNm, M_{yy} = 100 kNm and the moments at the bottom M_{xx} = 250 kNm and M_{yy} = 110 kNm. Use M30 concrete and Fe-415 grade steel.

Or

13. Design a square footing for a circular column of 500 mm diameter, reinforced with 8 numbers of 25 mm diameter bars and carrying a service load of 1250 kN. Assume soil with allowable pressure of 200 kN/m^2 at depth of 1.25 m below ground. Adopt M20 concrete for column, M25 concrete for footing and Fe-415 grade steel for both column and footing.

14. A counterfort retaining wall is to be retain a backfill of 5 m above the ground level. The density of the earth is 16 kN/m^3 and its angle of internal of friction is 30°. The safe bearing capacity of the soil is 180 kN/m^2, the coefficient of friction between the soil and concrete is 0.6 and the spacing of counterfort is 4 m centre to centre. Adopt M20 concrete and Fe-415 grade steel. Check the stability and design the toe slab.

Or

15. Design a reinforced slab culvert for the following requirements ; clear span = 6 m, width of supports = 400 mm, width of carriageway = 7.5 m, width of kerbs = 600 mm. Type of loading = IRC class AA or A whichever gives worst effect. Grade of concrete = 1720, Grade of steel Fe 415.

16. A prestressed beam 400 mm × 600 mm has a simple span of 6 m and is loaded with a uniformly distributed load of 20 kN/m including its own weight. The prestressing tendon is located at 150 mm from the bottom face. The effective prestress introduced through the tendons is 1000 kN. Calculate the extreme fibre stresses in the concrete at the mid-span due to the above load effects.

Or

17. A prestressed concrete beam of span 30 m is prestressed by a parabolic cable concentric at supports and having an eccentricity of 850 mm at centre of span. The effective stress in tendons is 1200 N/mm^2. The coefficient of friction between tendons and cable duct is 0.5 and the friction coefficient for wave effect is 0.0015 / m. If the anchorage slip is 5 mm, compute the loss of stress in tendons due to friction and anchorage slip. Assume E_s = 210 kN/m^2.

18. Design a steel beam of 5 m effective span, carrying a uniformly distributed load of 20 kN/m, if the compression flange is laterally unsupported. Assume f_y = 250 MPa.

Or

19. A plate girder is made with Fe 415 steel plates. The web plate is of the size 1200 × 12 mm and flange 440 × 36 mm. Check the adequacy of a pair of stiffeners of size 200 × 12 mm.

(4 × 10 = 40 marks)