D 42514 (Pages : 2) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION DECEMBER 2007

Civil Engineering

CE 04 701—STRUCTURAL DESIGN—III

(2004 admissions)

Time : Three Hours Maximum : 100 Marks

Assume any missing data suitably.

Use of IS 3370, IRC 21, IS 1343, IS 800, IS 875, SP 6, SP 16 permitted.

I. (a) What are the rules to be followed for placement of steel when using the charts in SP 16 for biaxial bending ?

(b) Indicate how the interaction diagram for columns under combined axial load and bending can be drawn ?

(c) What is the amount of minimum steel prescribed for footings according to IS 456. What consideration should be given in choosing the diameter of bars ?

(d) Discuss the formula given in IS 456 for the dispersion of load in plain footings.

(e) Discuss about the nature of stresses in spherical domes.

(f) What are the merits and demerits of prestressed concrete ?

(g) Discuss about the kern distances and efficiency of a prestressed section.

(h) Discuss about the curtailment of flange plates.

(8 × 5 = 40 marks)

II. (a) Design and detail a short column for the following data. Column size is 400 × 600 mm. P_u = 2000 kN ; M_{ux} = 120 kN-m, M_{uy} = 80 kN-m, use M 20 concrete and Fe 415 steel.

Or

(b) Design an isolated footing of uniform thickness for a RC column having a vertical load of 600 kN of dimensions 500 mm × 500 mm. The safe bearing capacity of soil may be taken as 120 kN/m^2. Use M 20 concrete and Fe 415 steel.

(15 marks)

III. (a) Design a solid slab bridge for class A loading as per the following data. Clear span = 4.5 m, clear width of roadways = 7 m. Average thickness of wearing coat = 80 mm. Use M 20 concrete Fe 415 steel.

Or

(b) A circular tank has 12 m diameter and 3 m water height. Determine (i) maximum hoop tension and its location and (ii) maximum bending moment. Use IS code method.

(15 marks)

Turn over

IV. (a) A simply supported prestressed concrete beam of rectangular cross-section 400 mm × 700 mm is loaded with a uniformly distributed load over a span of 6 m. The beam is prestressed by a parabolic tendon with a prestressing force of 1800 kN. The tendon has a sag of 100 mm at midspan. Find the extreme fibre stresses by load balancing concept if it is subjected to a u.d.l. of (i) 200 kN/m (ii) 380 kN/m.

Or

(b) A post-tensioned prestress concrete beam of 20 m span is subjected to a transfer prestress force of 2500 kN at 28 day's strength. The profile of the cable is parabolic with maximum eccentricity of 160 mm at midspan. Determine the loss of prestress and the jacking force required if jacking is done from both ends of beam. The beam has a cross-section of 500 mm × 750 mm and is prestressed with 9 cables, each cable consisting of 12 wires of 5 mm diameter. One cable is tensioned at a time. Take $E_s = 2.1 \times 10^5$ N/mm^2 ; $E_c = 3.5 \times 10^4$ N/mm^2.

(15 marks)

V. (a) Design the central section of a plate girder for an effective span of 20 m if the dead load is 40 kN/m and live load is 60 kN/m respectively. Show the curtailment of the flanges on a diagram.

Or

(b) A plate girder has an effective span of 16 m and is simply supported at its ends. It carries a uniformly distributed load of 120 kN/m exclusive of its self-weight. Design (i) the central section (ii) the rivets connecting the components, using at least two flange plates on each flange. Determine the theoretical points of cut-off for the flange plates of the girder.

(15 marks)

[4 × 15 = 60 marks]