C 56407 (Pages : 2) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2009

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) Explain the assumption regarding strain distribution in a column section under eccentric loading at ultimate failure.

(b) Give examples of columns that are in practice subjected to biaxial bending.

(c) What is the differences between the methods of checking for two way shear in IS and BS codes?

(d) Discuss the IS code methods for the design of water tanks.

(e) Write short note on classification and types of prestressing.

(f) What are the basic assumptions in prestressing?

(g) What are the losses of prestress?

(h) How do you calculate the economic depth of a web plate?

(8 × 5 = 40 marks)

II. (a) Design the longitudinal steel for a 500 mm × 300 mm column with ultimate loads Pu = 1800 kN, Max = 280 kN/m, Min. = 110 kN/m. Assume that M-30 concrete and Fe-415 steel is used and that the column is short.

Or

(b) Design an isolated footing for a square column 300 mm × 300 mm carrying a total ultimate load of 1800 kN. Safe bearing capacity of the soil is 150 kN/m^2. Use M-20 concrete and Fe-415 steel.

III. (a) Design a circular water tank with fixed base for a capacity of 200,000 litres. The depth of water is to be 3 m, including a free board of 25 cm. Assume $\eta = 0$. The tank is free at the top, and rests on the ground. Use M-20 concrete and Fe-415 steel.

Or

Turn over

(b) Design a solid slab bridge for class A loading as per the following data : Clear span = 5 m. clear width of roadways = 7 m. Average thickness of wearing coat = 80 mm. Use M-20 concrete and Fe-415 steel.

IV. (a) A simply supported prestressed concrete beam of rectangular cross-section 400 mm × 600 mm is loaded with a uniformly distributed load of 380 kN/m over a span of 6 m. The beam is prestressed with a parabolic tendon with a prestressing force of 1920 kN. The tendon has a sag of 120 mm at mid span. Find the extreme fibre stresses.

Or

(b) A pretensioned prestress concrete beam of 10 m span has a cross-section of 400 mm × 800 mm and is prestressed with 2000 kN at transfer. The cable has cross-sectional area of 2000 mm^2 of steel and has a parabolic profile with maximum eccentricity of 120 mm at the midspan. Determine the loss of prestress. Assume minimum ultimate tensile strength of prestressing steel as 1500 N/mm^2. Give $E_s = 2.1 \times 10^5$ N/mm^2, use M-30 concrete.

V. (a) A plate girder simply supported at ends is composed of a web plate 1250 mm depth × 16 mm thickness and two flange angles ISA 200 mm × 100 mm × 15 mm wide and two flange plates 550 mm wide × 16 mm thickness in each flange. The effective span of the plate girder is 18 m. The diameter of power driven rivets used for connecting flange plates to flange angles and flange angles to web plate is 22 mm. Determine the maximum uniformly distributed load inclusive of self weight which can be carried by the plate girder.

Or

(b) Design a web splice for a plate girder from the following data : Web plate of 2000 mm × 12 mm. Flange angles : ISA 200 mm × 100 mm × 15 mm; Net area of tension flange : 24642 mm^2; Gross area of compression flange : 28556 mm^2. Maximum bending moment at the section 6500 kN/m. Corresponding shear force at the section : 1320 kN. Flange plates in each flange : 2 × 500 mm × 16 mm.

(4 × 15 = 60 marks]