C 17899 (Pages : 2) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION JUNE 2011

CE 04 701—STRUCTURAL DESIGN—III

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Assume missing data if any suitably.

Use of IS 456, *IS* 3370, *IRC* 5, *IRC* 6, *IRC* 21, *IS* 1343, *IS* 800, *IS* 875, *SP* 6, *SP* 16 *are permitted.*

Part A

I. (a) (i) Why does the code require all columns to be able to resist a minimum eccentricity of loading ?

(ii) Why does the code specify limits to be minimum and maximum reinforcement in columns ?

(b) Under what circumstances is a trapezoidal shape preferred to a rectangular shape for a two–column combined footing ?

(c) Explain the terms :

(i) Effective depth.

(ii) Impact factor for slab bridge.

(d) Briefly describe the design steps of staging of circular water tank.

(e) Why high strength concrete and high tensile steel is required for prestressed concrete construction ?

(f) Discuss different losses of prestressing.

(g) Discuss different types of bearings used in plate girders.

(h) Explain the components of self supporting steel chimney.

($8 \times 5 = 40$ marks)

Part B

2. (a) Design a combined footing for two RC columns A and B separated by a distance 4 m centre to centre :

Column A is 500 mm square and carries a load of 800 kN.

Column B is 600 mm square and carries a load of 1000 kN.

The SBC of soil is 200 kN/m^2. Design the rectangular combined footing. Use M20 concrete and Fe 415 grade steel.

Or

Turn over

(b) Design the stem and toe slab to retain an earth embankment of 4.0 m above the ground level using the following data :

Density of earth	:	16 kN/m^3
Angle of internal friction	:	30°
Coefficient of friction between soil and base slab	:	0.5
SBC of soil	:	180 kN/m^2

Use M20 concrete and Fe 415 grade steel.

3. (a) Design a rectangular RC water tank resting on ground with an open top for a capacity of 85000 litres. The inside dimensions of the tank maybe taken as 6m × 4m. Design the side walls and base slab of the tank. Use M25 concrete and Fe 415 grade steel.

Or

(b) Design a simply supported RC slab for the deck of a road bridge for the following data :

Carriageway width	: 7.5 m
Clear span	: 6 m
Width of bearing	: 400 mm
Type of loading	: IRC class AA

Use M25 concrete and Fe 415 grade steel.

4. (a) A PSC unsymmetrical I section has following dimensions. Top flange = 500 mm × 180 mm, Bottom flange = 300mm × 220mm, Thickness of web = 150mm, Overall depth = 1100 mm, Span of the beam = 18 m. The beam carries a live load of 18 kN/m. Bottom flange contains 3 cables each containing 12 wires of 7 mm diameter stressed initially to 1200 N/mm^2. The cables are located at a distance of 100 mm from the bottom fibre. Determine the stresses at mid–span section at transfer and working load. Assume the loss ratio = 0.85.

Or

(b) A pre–tensioned prestress concrete beam of 9 m span has a cross-section of 400 mm × 800 mm and is prestressed with 2500 kN at transfer. The cable has cross–sectional area of 2500 mm^2 of steel and has a parabolic profile with maximum eccentricity of 120 mm at the middle of span. Determine the loss of prestress. Assume minimum ultimate tensile strength of prestressing steel as 1500 N/mm^2 and M30 concrete. $E_s = 2.1 \times 10^5$ N/mm^2.

5. (a) A plate girder of 15 m effective span supports concentrated loads of 160 kN at 3 m intervals. Design a suitable section at a distance of 4.5 m from the support and end-bearing stiffeners. Use power driven rivets.

Or

(b) Design a self supporting lined steel chimney to the following particulars :

Height of the chimney	= 90 m.
Diameter of chimney	= 5 m.
Thickness of lining	= 100 m.
Wind pressure	= 1800 N/m^2 on flat vertical surface.

Assume suitable safe stresses.

(4 × 15 = 60 marks)