C 5461 (Pages : 2) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2010

CE 04 701—STRUCTURAL DESIGN—III

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, SP16 are permitted.

Part A

1. (a) Discuss the IS Code provisions for the design of short and slender columns.

   (b) Under what circumstances the counterfort retaining wall is preferred ? Give briefly the design procedure for a counterfort retaining wall.

   (c) Discuss the nature of stresses and analysis of spherical domes.

   (d) Explain the design procedure for RC rectangular water tank.

   (e) Discuss the methods of prestressing.

   (f) Compare reinforced concrete and prestressed concrete construction.

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

   (h) Discuss horizontal and vertical stiffners used in plate girders.

(8 × 5 = 40 marks)

Part B

2. (a) Two RC columns A and B are carrying loads 500 kN and 700 kN respectively. The column A is 300 mm. × 300 mm. and column B is 400 mm. × 400 mm. The spacing of columns is 3.4 m. centre to centre. SBC of soil is 150 kN/m.^{2} Design the rectangular combined footing. Use M20 concrete and Fe415 grade steel.

Or

   (b) A counterfort type retaining wall is to be designed to support a soil embankment for the following data :—

Height of fill retained by wall	:	9 m.
Density of soil	:	16 kN/m.^{3}
Angle of internal friction	:	30°
Coefficient of friction between soil and base slab	:	0.6
SBC of soil	:	200 kN/m.^{2}

   Use M20 concrete and Fe415 grade steel. Design stem and counterfort.

3. (a) Design a rectangular RC water tank resting on ground with an open top for a capacity of 60000 litres. The inside dimensions of the tank may be taken as 5 m. × 4 m. Design the side walls and base slab of the tank. Use M25 concrete and Fe415 grade steel.

Or

[redacted]

Turn over

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

Carriage way width : 7.5 m.
Clear span : 5 m.
Width of bearing : 400 mm.
Type of loading : IRC class AA

Use M25 concrete and Fe415 grade steel.

4. (a) A PSC unsymmetrical I section has following dimensions. Top flange = 500 mm. × 160 mm. Bottom flange = 300 mm. × 200 mm. Thickness of web = 150 mm. Overall depth = 1000 mm., Span of the beam = 20 m. The beam carries a live-load of 15 kN/m. Bottom flange contains 3 cables each containing 12 wires of 7 mm.diameter stressed initially to 1100 N/mm.^{2} The cables are located at a distance of 100 mm. from the bottom fibre. Determine the stresses at midspan section at transfer and working load. Assume the loss ratio = 0.85.

Or

(b) A post tensioned PSC beam of 16 m. span is subjected to an initial prestress of 1485 kN transferred at 28 days strength of concrete. Profile of the cable is parabolic with the maximum eccentricity of 520 mm. at the centre of the span. Take the additional following data:

$A = 2.42 \times 10^5$ mm.^{2} $I = 5.43 \times 10^{10}$ mm.^{4}
$A_s = 1386$ mm.^{2} $f_s = 1059$ N/mm.^{2} at transfer
$E_s = 2.1 \times 10^5$ N/mm.^{2} $E_c = 0.382 \times 10^5$ N/mm.^{2}

μ-frictional coefficient = 0.25, wobble correction factor $k = 0.0015$/m., anchorage slip = 2.5 mm. Determine the following losses in prestress (a) loss due to elastic shortening, (b) Shrinkage in concrete, (c) creep in concrete, (d) slip in anchorage, (e) friction loss.

5. (a) Design a suitable midspan section of a plate girder of 20 m. effective span subjected to a superimposed load of 60 kN/m. over the entire span. Use power driven rivets.

Or

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

Height of the chimney = 70 m.
Diameter of chimney = 4 m.
Thickness of lining = 100 m.
Wind pressure = 1500 N/m.^{2} on flat verticl surface

Assume suitable safe stresses.

(4 × 15 = 60 marks)

[redacted]