(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2454 Roll No. | | | | | | | | | | |

B.Tech.

(SEMESTER-VI) THEORY EXAMINATION, 2012-13

DESIGN OF CONCRETE STRUCTURES – II

Time : 3 Hours] *[Total Marks : 100*

SECTION – A

1. Attempt **all** question parts : **10 × 2 = 20**

(a) What type of precast prestressed concrete sections do you recommend for covering large spans ?

(b) What are the salient design features of prestressed concrete one way and two ways slab panels ?

(c) What are the main requirements of a foundation system for a structure ?

(d) Why is it desirable to eliminate eccentricity in loading on a footing, wherever possible, by means of proper proportioning ?

(e) What is meant by surcharge and inclined surcharge ?

(f) What is the purpose of retaining wall ?

(g) Define the term 'tank' and classify them.

(h) What are the factors that should be considered while designing R.C.C. tank ?

(i) Define the terms : tendom, anchorage, pre-tensioning and post-tensioning.

(j) State the assumptions made in prestressed concrete design.

SECTION – B

2. Attempt any **three** question parts : **10 × 3 = 30**

(a) (i) Explain briefly the advantages of using prestressed concrete floor slabs mentioning their common applications.

(ii) What are advantages of prestressing flat slab floor panels ? Sketch the cross section of a simple flat slab showing the typical cable profile.

(b) Design a plain concrete footing for a column, 300 mm × 300 mm, carrying an axial load of 330 kN (under service loads, due to dead and live loads), assume an allowable soil bearing pressure of 360 kN/m^2 at a depth of 1.0 m below ground. Assume M20 concrete and Fe 415 steel.

(c) Design a suitable counterfort retaining wall to support a level backfill, 7.5 m high above the ground level on the toe side. Assume good soil for foundation at a depth of 1.5 m below the ground level with a safe bearing capacity of 170 kN/m^2. Further assume the backfill to comprise granular soil with a unit weight of 16 kN/m^3 and an angle of shearing resistance of 30°. Also assume the coefficient of friction between soil and concrete to be 0.5. Use M25 grade concrete and Fe 415 grade steel.

(d) Design a circular tank for a capacity of 500 KL with flexible joint at the base. Use (i) mild steel reinforcement (ii) HYSD bars.

(e) What are the advantages and disadvantages of prestressed concrete over the reinforced concrete construction ?

SECTION – C

Attempt **all** questions : **10 × 5 = 50**

3. Attempt any **one** part : **10**

(a) A simple flat slab 12 m by 9 m is supported by four columns so placed as to form a symmetrical rectangular grid, 7 m by 6 m, the cantilevers formed are 2.5 and 1.5 m in the long and short directions of the slab. The live load on the slab is 1 kN/m^2. Prestressing cables consisting of four wires of 5 mm carrying an effective force of 100 kN are available for use. Design the numbers of cables required and arrange them suitably in the two principal directions.

(b) Design a continuous prestressed flat slab floor of overall size 16 m by 16 m, the columns are spaced at 7.5 m intervals in the perpendicular direction. The floor slab has to support a superimposed load of 3 kN/m^2, freyssinet cables, consisting of 12 wires of 5 mm diameter stressed to 1000 N/mm^2, are available for use. Determine the number of cables required and their spacing in each direction.

4. Attempt any **one** part : **10**

(a) Design an isolated footing for a square column, 450 mm × 450 mm, reinforced with 8-25ϕ bars and carrying a service load of 2300 kN. Assume soil with a safe bearing capacity of 300 kN/m^2 at a depth of 1.5 m below ground. Assume M20 grade concrete and Fe 415 grade steel for the footing and M25 concrete and Fe 415 steel for the column.

(b) Design a reinforced concrete footing for a 230 mm thick masonry wall which supports a load of 200 kN/m under service loads. Assume a safe soil bearing capacity of 150 kN/m^2 at a depth of 1 m below ground. Assume M20 grade concrete and Fe 415 grade steel.

5. Attempt any **one** part : **10**

(a) Briefly describe the behaviour of the various elements of a cantilever retaining wall and a counterfort retaining wall.

(b) Suggest suitable proportions for a counterfort retaining wall to support difference in ground elevation of 9 m, the foundation depth may be taken as 1.5 m below ground level, with a safe bearing capacity of 160 kN/m^2. Assume a level backfill with a unit weight of 16 kN/m^3 and an angle of shearing resistance of 30°. Also assume coefficient of friction, μ = 0.5, between soil and concrete. Check the stability of the wall.

6. Attempt any **one** part. **10**

(a) Design a rectangular tank resting on ground for a capacity of 80 kL. Use M25 concrete and Fe 415 grade steel.

(b) Design an underground rectangular tank 10 m × 6 m × 3 m deep. The tank is covered at top. Take the density of soil as 16000 N/m^3 and angle of repose as 30°. Use M25 concrete and Fe 415 grade steel.

7. Attempt any **one** part : **10**

(a) A prestressed concrete beam is required to carry a total UDL of 30 kN over a span of 12 m using a rectangular section, determine the suitable dimensions of the beam. Calculate the size of the tendon and its location. Use M30 concrete and permissible stress in tendon material is 1000 N/mm^2.

(b) A prestressed beam with width of section 150 mm and depth of section as 350 mm is used over a span of 6 m and supports a UDL of 4 kN/m including self-weight of beam. Beam is prestressed by a cable carrying a force 200 kN and at an eccentricity of 50 mm. Determine the location of thrust line giving position at quarter and central span sections.
