Total No. of Questions : 10]

SEAT No. :

P3011

[Total No. of Pages : 3

# [5670]-103
# B.E.(Civil)
# STRUCTURAL DESIGN AND DRAWING - III
# (2012 Pattern)

*Time : 3 Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer Q.1 or Q.2; Q.3 or Q.4; Q.5 or Q.6; Q.7 or Q.8; and Q.9 or Q.10.***
2) ***Figures in bold to the right, indicate full marks.***
3) ***Latest revision of IS: 456, 1343,1893 and 3370 (Part II and IV) are allowed in the examination.***
4) ***If necessary, assume suitable data and indicate clearly.***
5) ***Use of electronic pocket calculator is allowed.***

***Q1)*** a) Explain shrinkage loss in pre-stressed concrete. Explain the procedure to find this loss. How can these losses be reduced? **[4]**

b) Explain P line and C line concept. Determine the profile of a load balancing cable for a simply supported beam of rectangular cross section 400 mm x 600 mm and span 6 meters carrying an all-inclusive load of 50 kN/m. The pre-stressing force in the tendon is 1200 kN. **[6]**

OR

***Q2)*** a) Explain the advantages of prestressed beam with respect to RCC beam in terms of structural behaviour. **[4]**

b) For a prestressed beam of span 15 m, the permissible stress of concrete in compression is 14 MPa and in tension is 1.4 MPa. The beam has a symmetrical I section with top and bottom width of 300 mm, flange depth of 150 mm and web thickness of 120 mm with overall depth of 750 mm. Check the adequacy of the section dimensions and the minimum prestressing force if the beam has to carry a super imposed load of 15 kN/m. Grade of the concrete to be used is 45 MPa. Loss ratio can be taken as 0.85. **[6]**

***Q3)*** a) Enumerate the steps for calculating the shear resistance of a post tensioned pre-stressed beam. **[4]**

***P.T.O.***

b) A braced building of 15 m height having plan dimensions 20 m x 25 m has 5 similar bays. The seismic load is 15800 kN with same seismic load on each floor including roof level. Floor height provided is 3 m. lnfill walls are present in the frame. The building is situated in zone II. Footing is resting on hard rock. Using the seismic coefficient method, determine the base shear and its distribution along the height. Also enumerate the limitations of seismic coefficient method. **[6]**

OR

***Q4)*** a) Explain the codal provisions for calculating the moment resistance in a pre-stressed member. Also state the codal requirements for the provision of untensioned steel. **[4]**

b) Using cantilever method, find the moments and shears in all beams of an external frame of a building. The building consists of three symmetrical frames comprising of three storey with two equal bays of 3.2 m width. The frames are placed 5 m c/c. Th lateral panel point loads of a frame are 54 kN at terrace floor and 28 kN at typical floor. **[6]**

***Q5)*** a) Draw the active earth pressure diagram showing the expression for maximum earth pressure for the backfill consisting of submerged soil. Draw the typical bending moment diagram for the stem giving the expressions of bending moment at base. **[4]**

b) A T-shaped retaining wall is to be provided to retain a backfill of 4 m height. The unit weight of the soil is 1 7 kN/$m^3$ Angle of repose = 29°, Coefficient of friction between concrete and soil = 0.54, SBC of soil = 175 kN/$m^2$. Select proper dimensions of the components of the wall and perform the stability analysis of the retaining wall. **[12]**

OR

***Q6)*** Design a T-shaped retaining wall to retain an inclined backfill of 4 m height. The inclination angle of the surcharge is 10 degrees The unit weight of the soil is 17 kN / $m^3$, angle of repose = 30°, coefficient of friction between concrete and soil =0.54, SBC of soil = 175 kN/$m^2$. Perform the stability checks and design the stem. Show a typical detailing of a T shaped retaining wall showing the position of main reinforcement in all elements. **[16]**

***Q7)*** a) Two columns are spaced 2 m apart carrying a characteristic load of 600 kN and 700 kN each. The columns are 300 mm X 300 mm and 500 mm X 500 mm respectively. The lighter column flushes with the property line. The SBC of soil is 150 kN / $m^2$. Determine the dimensions of the combined footing. **[3]**

b) Design a slab type combined footing for two boundary columns spaced 4.5 m apart. The columns are 400 mm X 400 mm. Both columns carry 900 kN characteristic loads. The SBC of soil is 180 kN / $m^2$. Use M30 grade of concrete and steel of grade Fe 500. **[13]**

OR

***Q8)*** Design a slab-beam type combined footing for two columns spaced 3.8 m apart carrying a characteristic load of 600 kN and 800 kN each. The columns are 300 mm X 300 mm and 400 mm X 400 mm respectively. The SBC of soil is 150 kN / $m^2$. The width of the slab shall be restricted to 2.0 m. Use M30 grade of concrete and steel of grade Fe 500. **[16]**

***Q9)*** a) Design a circular water tank of 12.5 m diameter and 3 m height resting on the ground and free at top, with a rigid base Using IS code method to determine the bending moments. **[8]**

b) Design the section of a circular water tank which is subjected to a maximum hoop tension of 210 kN. Use Fe 500 grade of steel and M 30 grade of concrete. Check for the limiting design surface crack width up to 0.2 mm. **[10]**

OR

***Q10)*** Design the rectangular water tank of 2.5 m high, open at top and resting on ground having a size of 8.0 m X 4 m. Use M 30 and Fe 500 grade material. Sketch details of reinforcement for the wall. **[18]**