Total No. of Questions :10]

SEAT No. :

P3067

[Total No. of Pages : 3

[5461]-103
B.E. (Civil)
STRUCTURAL DESIGN AND DRAWING - III
(2012 Pattern) (Semester - I) (401003)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q2, Q.3 or Q4, Q.5 or Q6, Q.7 or Q8, Q.9 or Q10***
2) ***Figures in bold to the right indicate full marks.***
3) ***IS 456, IS 1343, IS 3370 and IS 1893 are allowed in the examination.***
4) ***The designs should comply with the latest codal provisions.***
5) ***If necessary, assume suitable data and indicate clearly.***
6) ***Use of electronic pocket calculator is allowed.***

Q1) a) Explain the procedure to decide the profile of cable while designing a simply supported prestressed beam. **[4]**

b) A prestressed simply supported concrete beam is 120 mm wide and 300 mm deep with an effective span of 6 m. It supports an UDL of 4 kN/m, which includes the self-weight of the beam. The beam is prestressd by a straight cable carrying a force of 200 kN located at an eccentricity of 50 mm. Determine the location of the thrust line along the beam and plot its position at mid-span, quarter span and support section. **[6]**

OR

Q2) a) Explain the time dependent losses in prestressed concrete. **[4]**

b) The end block of a post tensioned beam is 600 mm wide and 600 mm deep. Four cables each made of 8 wires of 12 mm diameter strands carrying load of 1160 kN. The cables are anchored by plate anchorage 160 mm square located with their centers at 135 mm from edges of the end block. The cable duct is 50 mm in diameter. Assume f_{ck} = 40MPa, and f_{ci}=25 MPa. Using the IS code provisions, check the bearing stresses. **[6]**

P.T.O.

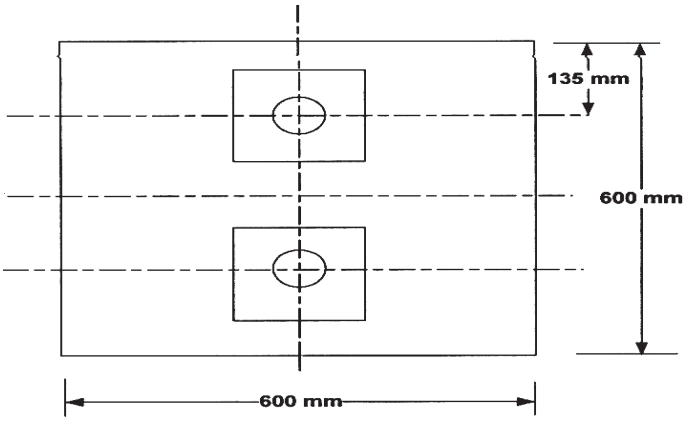

Fig.1

Q3) a) Explain the codal provisions for permissible compressive and tensile stresses of concrete in prestressed concrete structure. **[4]**

b) Using seismic coefficient method, calculate the base shear and show shear distribution over the height of four storey reinforced concrete office building located in Pune. There are four frames placed c/c distance of 7.5 m with three bay of size 7.5 m. Storey height of 3m is provided. The column and beam sizes may be taken as 400 mm ×400mm and 250 mm × 400 mm respectively. Thickness of slab is 150 mm. The wall thickness is 120 mm with 20 kN/m^{3}density. Consider OMRF structure. Consider live load as 3 kN/m^2. **[6]**

OR

Q4) a) What are bursting and bearing stresses. Explain in detail the design of end block of a prestressed beam. **[4]**

b) Using the portal method for lateral load analysis, find the moments and shears in all beams and columns for an internal frame of 2 bay of 4 m width and three storey of 3.5 m height each configuration. A building consists of three frames spaced 5m c/c and the lateral loads acting at panel point of a frame are 17 kN at terrace floor and 25 kN at typical floor. **[6]**

Q5) a) Explain with neat sketches, types of retaining wall. **[2]**

b) Perform the stability analysis for L-shaped retaining wall provided to retain a horizontal leveled backfill having unit weight respectively equal to 17 kN/m^3. Angle of repose = 30°, Coefficient of friction between concrete and soil =0.55, SBC of soil = 150 kN/m^2, depth of foundation = 1.0 m. Also check the stability of wall in submerged condition. Take submerged density of soil as 15 kN/m^3. **[14]**

OR

Q6) Design a T-shaped retaining wall of height 5.2 m to retain a backfill with two different layers. The upper layer of 2.5 m height is having unit weight equal to 17 kN/m^3 with angle of repose = 30°. The lower layer has unit weight of 18 kN/m^3 and angle of repose equal to 28°. Coefficient of friction between concrete and soil = 0.55, SBC of soil = 150 kN/m^2, depth of foundation = 1.2m. Sketch the details of reinforcement in the wall and base slab. **[16]**

Q7) a) Draw the deflected shape of slab type of footing in longitudinal direction and show the typical detailing of a longitudinal section of footing. **[3]**

b) Design a slab type combined footing for two boundary columns spaced 2.5 m apart out to out. The columns are 400 mm × 400 mm. Both columns carry 500 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 3.5m apart center to center carrying a service load of 800 kN and 1000 kN each. The columns are 400 mm × 400 mm and 500 mm × 500 mm respectively. The width of the footing is limited to 2.2 m. The SBC of soil is 180 kN/m^2. Use M25 grade of concrete and steel of grade Fe 500. **[16]**

Q9) a) Using coefficients from IS 3370, determine the bending moments and hoop tension at 1m interval of height for a circular water tank of height 4m and diameter 8m. The tank wall is free at top and hinged at bottom.**[6]**

b) Design the wall of a square water tank of size 4.0 m × 4.0 m ×3.0m. Use Fe 500 grade of steel and M30 grade of concrete. Provide detailing of reinforcement. **[12]**

OR

Q10) Design a rectangular water tank open at top resting on ground having a size of 5.5m × 4.0m × 2.5m high. Use M35 and Fe 500 grade material. Sketch details of reinforcement for the wall. **[18]**