Total No. of Questions :10]

SEAT No. :

P3654

[Total No. of Pages :3

[4959]-1003
B.E. (Civil)
Structural Design and Drawing -III
(2012 Pattern) (End Semester) (Semester - I) (401003)

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) ***IS 456, IS 1343, IS3370 and IS 13920 are allowed in the examination.***
4) ***The designs should comply with the letest codal provisions.***
5) ***If necessary, assume suitable data and indicate clearly.***
6) ***Use of electronic pocket calculator is allowed.***

Q1) a) What are bonded and unbonded prestressed concrete members? **[4]**

b) Calculate the loss of pre-stress due to elastic shortening of concrete in a simple supported pre-tensioned beam of effective span 20m. The cross-section of the beam is an I-section having the top and bottom flanges as (700 X 200) mm and the web of width 150 mm. The overall depth of the beam is 1,200 mm. The prestressing cable of cross-sectional area of 2,100 mm^2 is provided at 100 mm from the bottom. The initial pre-stress in steel may be taken as 1,360 N/mm^2. The stress in concrete at transfer is 30 N/mm^2. **[6]**

OR

Q2) a) What are Type -I, -II and , -III prestressed concrete members? **[4]**

b) An end block of a post tensioned beam is 350 mm X 500 mm. The prestressing force is 900 kN with the tendon placed centrally at the ends. A bearing plate of 200 mm X 200 mm is provided. Check for the bearing stresses developed in concret whose strength at transfer is 40 N/mm^2. **[6]**

Q3) a) Explain the necessity of designing anchorage zone in post tensioned beam with reference to stress trajectories. How the design of end block will be carried out. **[4]**

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b) For an unbraced building having plan dimensions 30 m x 30 m, the total seismic load on a frame having 5 similar bays is 14800 kN. The building is situated in zone III. Footing is resting on medium soil. The total height of the building is 28 m with floor height as 4 m. Calculate the base shear and show shear distribution over the height of the building. **[6]**

OR

Q4) a) Explain the Indian standard code provisions for calculating the moment of resistance for rectangular beams. **[4]**

b) A building consists of three frames comprising of three storey with two equal bays of 4 m width. The frames are placed 5m c/c. The lateral panel point loads of a frame are 18 kN at teracce floor and 24 kN at typical floor. Find the moments and shears in all beams for the internal frame by suitable method. **[6]**

Q5) a) For a T- shaped retaining wall draw the active earth pressure diagram showing the expression for maximum earth pressure for the following conditions. **[4]**

i) Backfill is a completely submerged soil with top surface horizontal, and

ii) Backfill is horizontal with uniform surcharge w_s/ unit run.

b) Perform stability analysis for a T- shaped retaining wall provided to retain a horizontal leveled backfill which consists of two layers of 2 m each. The upper layer and bottom layer has unit weight respectively equal to 17 kN/m^3 and 18 kN/m^3 Angle of repose for both layers =30°, coefficient of friction between Concrete and soil = 0.55, SBC of soil =150 kN/m^2, depth of foundation = 1.0 m. **[12]**

OR

Q6) Design a L- shaped retaining wall to retain a backfill of 3.2 m. The backfill is horizontal; and is subjected to a surcharge of 10 kN /m^2 acting over a length of 2 m starting from 1 m from the face of the wall. The unit weight of the soil is 17 kN /m^3, angle of repose = 30°, SBC of soil = 180 kN/m^2, good foundation is available at a depth of 1.0 m. Sketch the details of reinforcement in the wall and base slab. **[16]**

Q7) a) Why it is necessary to combine the footing? **[3]**

b) Design a slab-beam type combined footing for two boundary columns spaced 4.0 m apart. The columns are 230 mm X 400 mm. Both columns carry 600 kN characteristic loads. The SBC of soil is 200 kN / m^2. Use M30 grade of concrete and steel of grade Fe 500. **[13]**

OR

Q8) Design a slab type combined footing for two columns spaced 3.5 m apart carrying a service load of 600 kN and 1000 kN each. The columns are 400 mm X 400 mm and 600 mm X 600 mm respectively. The center of lighter column is 0.4 m from the property line. The SBC of soil is 180 kN/m^2. The width of the slab shall be taken as 2.0 m. Use M30 grade of concrete and steel of grade Fe 500. **[16]**

Q9) a) A rectangular water tank 5 m X 2.5 m X 2.5 m high is resting on ground. The tank wall is free at top and hinged at bottom. Determine the maximum bending moments at mid - span and support as per IS 3370 in the long wall and short wall. **[6]**

b) Using limit state method, design the section of a circular water tank with flexible base and resting on ground. The wall is subjected to a maximum hoop tension of 240 kN. Use Fe 500 grade of steel and M 35 grade of concrete. The limiting design surface crack width may be taken as 0.1 mm. **[12]**

OR

Q10) Design the long wall for a rectangular water tank open at top resting on ground having a size of 8.0 m X 3.6 m X 2.5 m high. Use M 30 and Fe 500 grade material. Sketch details of reinforcement for the wall. **[18]**