Total No. of Questions : 10]

SEAT No. :

P3645

[Total No. of Pages : 3

[4859]-1003

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 orQ.8 and Q.9 or Q.10.***
2) ***Figures in bold to the right indicate full marks.***
3) ***IS: 456, IS: 1343, IS: 3370, IS: 1893 and IS: 13920 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) What is concordant cable profile? Explain with an example. **[6]**

b) An end block of a post tensioned beam is 350 mm × 500 mm. The effective prestressing force is 800 kN with the tendon placed centrally at the ends. The strength of concrete at transfer is 40 N/mm^2. Check the bearing stresses if a bearing plate of 200 mm × 200 mm is provided. **[4]**

OR

Q2) a) Explain load balancing concept with a suitable example. **[6]**

b) An end block of a post tensioned beam is 350 mm × 500 mm. The prestressing force is 800 kN with the tendon placed centrally at the ends. A bearing plate of 200 mm × 200 mm is provided. Calculate the bursting force and design the reinforcement using Fe 500. **[4]**

Q3) a) Explain the mechanism of transfer of pre-stress in pre-tensioned concrete members and highlight the role of transmission length. **[4]**

b) A two span continuous ground beam ABC has a span AB = 6 m and BC = 6 m. The beams are of size 230 mm × 600 mm. The total load on the beam is 25 kN/m (inclusive of its self-weight). The moment due to EQ loads is 125 kNm. Calculate the design moments only at the supports as per IS 1893. **[6]**

P.T.O.

OR

Q4) a) Explain the criteria for limit state of cracking in prestressed concrete members. **[4]**

b) A two span continuous floor beam ABC has a span AB = 6 m and BC = 6 m. The beams are of size 230 mm × 600 mm. Considering the effect of reversal of loads, the design moments and shear are as follows: $M_{u,(A+)}$ = 150 kNm, $M_{u,(A-)}$ = 350 kNm, $M_{u,(AB+)}$ = 110 kNm, $M_{u,(B+)}$ = 90 kNm, $M_{u,(B-)}$ = 400 kNm, $M_{u,(BC+)}$ = 90 kNm, $V_{u,(AB)}$ = 180 kN, $V_{u,(BA)}$ = 200 kN, $V_{u,(BC)}$ = $V_{u,(CB)}$ = 220 kN. Design the beam AB only. Use M30 grade of concrete and steel of grade Fe 500. **[6]**

Q5) a) What are earth retaining structures? Give suitable examples. **[4]**

b) Perform stability analysis for a T-shaped retaining wall and calculate the factor of safety against overturning, sliding and check for maximum pressure at the base. The details of the retaining wall are as follows:

Overall height = 5.0 m, thickness of stem at base = 350 mm and 200 mm at top, thickness of base slab = 350 mm, width of base slab = 2.70 m, width of toe = 0.80 m. The top surface of the backfill is horizontal and has the following properties: unit weight = 17 kN/m^3, coefficient of friction between concrete and soil = 0.55, angle of repose = 30º, 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 m. The backfill is horizontal and is subjected to a surcharge of 10 kN/m^2 acting over a length of 5 m from the face of the wall. The unit weight of the soil is 18 kN/m^3, angle of repose = 30º, 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) A slab-beam type combined footing is designed for two boundary columns A and B, 3 m apart. Sketch the typical details of reinforcement in the beam and slab in longitudinal and transverse sections. **[3]**

b) Design a slab type combined footing for two columns spaced 3 m apart carrying a service load of 600 kN each. The columns are 300 mm × 300 mm. 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. Sketch the details of reinforcement. **[13]**

OR

Q8) Design a slab-beam type combined footing for two boundary columns spaced 4.0 m apart. The columns are 300 mm × 300 mm. The working loads from the column are 700 kN each. The SBC of soil is 175 kN/m^2. Use M30 grade of concrete and steel of grade Fe 500. Sketch the details of reinforcement. **[16]**

Q9) a) A rectangular water tank 4.5 m × 2.25 m × 2.25 m 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) 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 260 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) a) Explain the procedure to assess the crack width in flexure in water retaining structures as per the latest codal provisions. **[4]**

b) Design a square water tank resting on ground for a capacity of 75,000 liters. Use M 30 grade of concrete and steel of grade Fe 500. Sketch the details of reinforcement. **[14]**