[6263]-65

B.E.(Civil)

DESIGN OF PRESTRESSED CONCRETE STRUCTURES
(2019 Pattern) (Semester - VII) (401004E) (Elective - IV)

Time : 3 Hours]   *[Max. Marks : 70*
Instructions to the candidates:
    1)   *Solve Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.*
    2)   *Neat diagrams must be drawn wherever necessary.*
    3)   *Figures to the right indicate full marks.*
    4)   *Use of electronic pocket calculator is allowed.*
    5)   *IS1343:2012 and IS456:2000 code of practice are allowed.*
    6)   *Assume suitable data if necessary.*

Q1) a)   An I section post tensioned beam has 400 mm × 100 mm top flange; 200 mm × 100mm bottom flange; 100 mm thick web and 500 mm overall depth. The prestressing force is l000kN with tendon placed centrally at the ends. Design the end bearing plate. The strength of concrete at transfer is 40 MPa. **[10]**

b)   The end block of a post tensioned beam is 300 mm × 500 mm. The prestressing force 600 kN with the tendon placed centrally at the ends. A bearing plate of 200mm × 200 mm is provided. Check the bearing stresses developed in concrete having strength, at transfer equal to 40 MPa. **[7]**

OR

Q2) a)   A pre-tensioned pre-stress concrete beam of rectangular section is to be designed for ultimate moment of 125 kN.m. Design the section using M40 grade of concrete and $f_{pu} = 1600N/mm^2$. **[7]**

b)   A prestress concrete I section beam is simply supported over a span of 8m supporting a live load of 4 kN/m. The beam has an overall depth of 400mm. The thickness of flange and web are 60mm and 80mm respectively. The width of the flange is 200mm. Find the eccentricity required for the prestressing force of 200kN such that the resultant stress is zero at the bottom fiber of central section. **[10]**

Q3) a) A slab spanning 10 m is to be designed as a one-way prestressed concrete slab with parallel post tensioned cables carrying an effective force of 400kN. The deck slab is required to support an udl of 8 kN/m². The permissible stresses in concrete should not exceed 14 N/mm² in compression and no tension is permitted at any stage. Design the spacing of the cables and their position at mid span section. Assume loss ratio 0.8. **[10]**

b) Design a post tension two-way slab of effective span 6m × 8m with continuity on all sides, subjected to superimposed load 4kN/m². Take F.F. load = 1.5 kN/m². Use cable S_3 or S_4 fck = 40 N/mm², f_y of S_3 or S_4 = 1900 N/mm². Design the spacing of cable in both directions. Don't apply checks. **[8]**

OR

Q4) a) A slab spanning 10m is to be designed as a one-way prestressed concrete slab with parallel post tension cables carrying an effective force of 500kN. The deck slab is required to Support a udl of 10 kN/m². The permissible stresses in concrete should not exceed 12 N/mm² in compression and no tension is permitted at any stage. Design the spacing of the cables and their position at mid span section. Assume loss ratio 0.8. **[10]**

b) Design a post tension two-way slab of effective span 8m × 10m with continuity on all side, subjected to superimposed load 6 kN/m². Take F.F. load = 1.0 kN/m². Use cable S_3 or S_4, fck = 40 N/mm², fy of S_3 or S_4 = 1800 N/mm². Design the spacing of cable in both directions. Don't apply checks. **[8]**

Q5) Design a post tensioned flat slab for the following data. **[18]**

a) Centre to center distance between columns = 10m in both directions Column size-1000 mm square Floor is to be used for a hospital building.

b) Live load - 3 kN/m²

c) Floor finish - 1kN/m²

d) Materials - M40, multistrand cables

e) Slab with drop

OR

Q6) Design a post tensioned fiat slab for the following data. **[18]**

   a) Centre to center distance between columns = 8m in both directions

   b) Column size-600mm diameter Floor is to be used for an Parking floor of community building

   c) Live load - 5 kN/m²

   d) Floor finish - 1 .5kN/m²

   e) Materials - M45, multistrand cables

   f) Slab with drop

Q7) Fig.1 shows a two span continuous beam. Corresponding to the cable profile provided locate the pressure line due to prestress alone. The prestressing force is 800kN. **[17]**
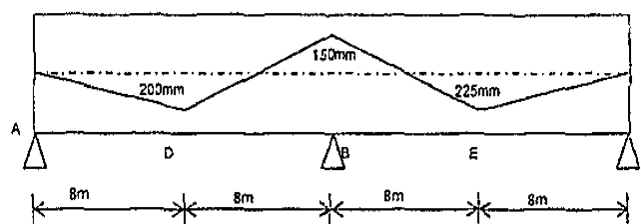

Figure 1

OR

Q8) Fig.2 shows a two span continuous beam. Corresponding to the cable profile provided locate the pressure line due to pre-stress alone. The pre-stressing force is 1250 KN. **[17]**
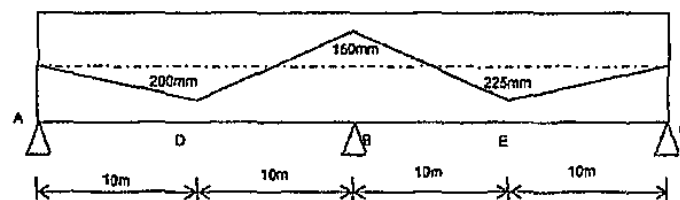

Figure 2

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