Total No. of Questions : 8] **SEAT No. :**

PC2353 **[Total No. of Pages : 3**

[6354]-469
B.E. (Civil)
DESIGN OF PRESTRESSED CONCRETE STRUCTURES
(2019 Pattern) (Semester - VII) (401004 E) (Elective - IV)

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

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
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) A post-tensioned prestressed beam of rectangular section 250mm wide is to be designed for an imposed load of 10 kN/m, uniformly distributed on a span of 10 m. The stress in the concrete must not exceed 15N/mm^2 in compression or 1.2 N/mm^2 in tension at any time and the loss of prestress may be assumed to be 15%. **[10]**

Calculate:

i) The minimum possible depth of the beam

ii) For the section provided, the minimum prestressing force and the corresponding eccentricity

b) A pre-tensioned T-section has a flange which is 300mm wide and 200mm deep. The rib is 150mm wide and 350mm deep. The effective depth of the cross section is 500mm. If f_{ck} = 50 N/mm^2, f_{pu}=1600N/mm^2, and the area of pre-stressing steel A_{ps}= 200mm^2. Calculate the ultimate flexural strength of the section using IS1343 code provisions. **[8]**

OR

Q2) a) The end block of a post tensioned beam is 350mm × 500mm. The pre-stressing force 900 kN with the tendon placed centrally at the ends. A bearing plate of 200mm × 200mm is provided. Check the bearing stresses developed in concrete having strength, at transfer equal to 40 MPa. **[10]**

b) A pre-tensioned pre-stress concrete beam of rectangular section is to be design for ultimate moment of 125 kN/m. Design the section using M40 grade of concrete and f_{pu} = 1600N/mm^2. **[8]**

P.T.O.

Q3) a) A slab spanning 8m in is to be designed as a one-way prestressed concrete slab with parallel post tensioned Cables carrying an effective force of 420kN. The deck slab is required to support a udl of 10kN/m^2. The permissible stresses in concrete should not exceed 15N/mm^2 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) Evaluate the importance of serviceability considerations in determining the spacing of post-tensioning cables for two-way slabs with suitable example. **[7]**

OR

Q4) a) A slab spanning 6m is to be designed as a one-way prestressed concrete slab with parallel post tensioned cables carrying an effective force of 420kN. The deck slab is required to support an udl of 15kN/m^2. The permissible stresses. in concrete should not exceed 15N/mm^2 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) Discuss the key factors influencing the determination of cable spacing in post-tensioned one-way slabs. **[7]**

Q5) a) Explain the P - line and C-line concept for finding the stresses in a section of prestressed continuous beam. **[7]**

b) Design a post tensioned flat slab for the following data. **[10]**

i) Centre to centre distance between columns = 6m in both directions

ii) Column size - 600mm

iii) Square Floor is to be used for a shopping mall

iv) Live load-3 kN/m^2

v) Floor finish-1kN/m^2

vi) Materials-M40, multistrand cables

vii) Slab with drop

OR

Q6) Design a post tensioned fiat slab for the following data. **[17]**

a) Centre to center distance between columns = 10m in both directions

b) Column size - 800mm

c) Diameter floor is to be used for a pharmaceutical company

d) Live load - 5kN/m^2

e) Floor finish -1kN/m^2

f) Materials - M40, multistrand cables

g) 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 in 1000kN. **[18]**

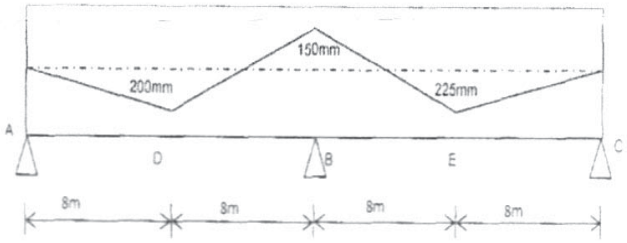

Figure 1

OR

Q8) A continuous prestressed concrete beam ABC (AB=BC=10m) has a uniform rectangular cross section with a width of 100 mm and depth of 300mm. The cable carrying an effective prestressing force of 360kN is parallel to the axis of the beam and located at 100 mm from the soffit. **[18]**

a) Determine the secondary and resultant moment at the central support B.

b) If the beam supports an imposed load of 1.5 kN/m, calculate the resultant stresses at top and bottom of the beam at B. Assume density of concrete as 25kN/m^3.

c) Locate the resultant line of thrust through beam AB.

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