BE-Sem-VII-old - Civil
PC

22/12/15

QP Code : 2442

Duration: 3 Hours **Maximum Marks: 100**

Note: 1.Question No.1 is compulsory. Attempt any four questions out of remaining six questions.
2. Assume data with suitable Justification, if needed.
3. IS-1343:1980 is permitted.
4. Support answers and solutions with neat and proportionate sketches.

Q1. A] A 4m span simply supported beam of C/s 420mmx600mm is prestressed by a parabolic cable with maximum eccentricity of 200mm at centre of span and concentric at support. Locate pressure line in the beam at transfer stage. Take PF 410 kN. **[05]**
B] Justify need of high strength steel and concrete in prestressed concrete construction? **[05]**
C] Explain any one method of post tensioning system of prestressing. **[05]**
D] What is safe cable zone? Develop equations for the same. **[05]**

Q2. A pretensioned slab panel 400mm wide and 200mm deep is provided on 5m simply supported span. Panel has to carry 5kN/m^2 imposed load. For no tension at any fiber at any stage at any section, determine spacing and eccentricity of 10mm dia wires. Each wire is carrying 60 kN force initially. Wires provided are straight.
Consider unit weight of concrete as 25kN/m^3 and 20% loss in prestressing force at service stage.
Also suggest suitable grade of concrete such that maximum compressive stresses in the extreme fiber is within permissible limits. **[20]**

Q3. 8m spanned, simply supported prestressed concrete beam is designed to carry uniformly distributed load.
a] Calculate deflection at transfer stage.
b] Calculate deflection at cracking.
c] Calculate deflection when beam is loaded with 1.25 times of cracking load.
Compare deflections in case a,b and c with corresponding IS limits.
Following are specifications of the beam,
Top and bottom flange: 400mm wide and 100mm deep
Web: 400mm clear depth and 100mm width
Cable: parabolic with eccentricity 150mm above neural axis at support and 250mm below neutral axis at mid span
Prestressing force: 300 kN at transfer
Loss factor: 0.85
Area of prestressing steel: 100mm^2
Grade of concrete: 50
Young's modulus of elasticity of steel: 2x10^5 MPa **[20]**

Q4. A rectangular beam 300mmx450mm is to carry 12kN/m (factored imposed udl) on 6m simply supported span. Calculate principal tension for the following cases.
a] Beam is not prestressed.
b] Beam is prestressed with a straight concentric cable. Take PF 200kN.
c] Beam is prestressed with a straight cable at 50mm from soffit of the beam. Take PF 200kN.
d] Beam is prestressed with a parabolic cable which is at 50mm from soffit of the beam at mid span and at 350mm from soffit of the beam at support. Take PF 200kN.
e] No horizontal or curved prestressing is provided but it is prestressed vertically by 5mmϕ wires at 100mm c/c with f_i=1200 mPa.
Comment by comparing principal tension in case b,c,d and e with case 'a'.

[TURNOVER

Q5. A two span continuous beam ABC of AB=9m and BC=9m is carrying 20kN/m (inclusive of self weight). C/s is 200mmx500mm. Beam is prestressed by parabolic cable which is concentric at supports A, B and C, but having maximum eccentricity of 100mm at mid span of AB and BC.

a] Locate C-line in the beam due to combined effect of prestressing force and loads.

b] Determine resultant stresses at in the extreme fibers at support sections A, B and C. Also determine resultant stresses in the extreme fibers at mid span section of span AB and span BC.

c] Make the cable concordant by linear transformation and recalculate the extreme fiber stresses at different sections for same load on beam. **[20]**

Q6. A] Calculate UMR of 250mmx500mm bonded post tensioned beam of 6m span.
Take Area of prestressing steel: 180mm^2, f_i =1000 MPa and f_p =1500 MPa. **[10]**

B] Provide an anchor plate of suitable dimension and thickness for a beam of cross section 250mmx500mm. A cable of 180mm^2 transfers a force of 150kN.Use M50 concrete. Make sure that stresses in concrete just behind the anchorage are within permissible limits. Take dia of duct 40mm. Permissible shear stresses in steel plate are 100MPa. Also design reinforcement to resist bursting tension. **[10]**

Q7. A] Calculate loss of stresses in steel in following pretension beam.
C/s: 250mmx550mm
Area of prestressing steel: 150mm^2
f_i =1000 MPa
f_p =1500 MPa
Cable: linear, concentric at support and 150mm below neutral axis at mid span
Young's modulus of elasticity of steel: 2.1x10^5 MPa
Young's modulus of elasticity of concrete: 0.3x10^5 MPa
Shrinkage strain in concrete: 0.0003 **[10]**

B] A post tensioned simply supported beam 'AD' of 8m span is of C/s 250mmx550mm. End A is anchored. Jacking force is applied from end D. For 2m span AB cable is linear. It is concentric at A and has eccentricity 200mm below neutral axis at B. For central 4m part of beam BC it is straight at 200mm below neural axis and for rest 2m span CD it linear and concentric at D.
Take f_d =1000 MPa, μ=0.3 and k=0.0015/m
Consider loss of stresses due to friction alone, calculate the stresses in cable at A, B and C. **[10]**

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