BCS SCHEM

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15CV82

Eighth Semester B.E. Degree Examination, De c. n.2020
Design of Prestressed Concrete Elements

Time: 3 hrs. Max. Marks: 80

Note: I. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS 1343-1980 is permitted.

Module-1

I a. Explain the need for High Strength conc and higher grade steel for PSC member. **(04 Marks)**

b. Define Pre-stressed Concrete. Explain the different types of Pre-stressed Concrete. **(04 Marks)**

c. A PSC inverted T beam section web 300x900mm. Flange 300x600mm simply supported over a span of 15m. The beam is tensioned by 3 cables each containing 12 wires of 7 mm diameter placed at 150mm from soffit at midspan. If the initial prestress is 1000 N/mm calculate the max UDL the beam can carry maximum compressive stress is limited to 15 MPa and tensile stress is limited to 1 MPa. Assume 15% loss of pre stress. **(08 Marks)**

OR

2 a. Explain Load Balancing Concept. **(02 Marks)**

b. Explain post tensioning anchorages devices and explain any one in details. **(06 Marks)**

c. A rectangular beam 200x300mm is pre-stressed by 15 wires of 5 mm diameter located at 65mm from bottom and 3 wires of 5mm diameter at 25mm from top initial pre-stress is 840 N/mm^2. Calculate stress at midspan. **(08 Marks)**

Module-2

3 a. Define loss of pre-stress. Explain different loss of pre-stress with suitable example. **(06 Marks)**

b. A post tensioned concrete beam 100x300mm span 10m is pre-stressed successively, tensioned and anchored by 3 cables each having C/S area 200 mm^2. Initial pre stress is 1200 N/mm^2. First cable is parabolic with e = 50mm at mid span and e = 50mm above NA at support. Second cable is parabolic with e = 50 at midspan and zero at support. Third cable is straight cable with 50mm eccentricity. Find the loss of pre-stress due to elastic deformation. Take m = 6. **(10 Marks)**

OR

4 a. Derive the expression for deflection for a beam of length / subjected to point load at mid span, UDL. Two point load symmetrically placed at middle third point. Prestress P applied on a straight cable with e as eccentricity and a parabolic cable with e = 0 at support and e at mid span. **(06 Marks)**

b. A simply supported beam having span 6m is post tensioned by 2 cable both having e = 50mm at mid span. First cable is parabolic and anchored 100mm above CG at support. Second cable is straight. C/s of each cable is 200mm^2 and initial prestress is 1200 N/mm^2. Area of cone 2x10^4 mm^2 radius of gyration 120mm. The beam support a two point load each 20 kN at middle third point Ec 38 kN/mm^2. Calculate (i) Short term deflection (ii) Long term deflection .Take 4 = 2, Loss of prestress 20%. (10 **Marks)**

Module-3

5 An unsymmetrical I section having top flange 750x200mm bottom flange 450x250mm thickness of web 150mm overall depth 1000mm. If permissible tensile and compressive stress at transfer and working load are not to exceed zero in tension 15 N/mm^2 in compression. Determine P and e to resist self weight and applied moment 1012 kNm and 450 kNm. Assume loss of pre stress 15%. **(16 Marks)**

OR

6 Design a post tensioned girder which is spaced 2.4 m c/c and has an effective span of 9m. Live load 15 kN/m^2, DL(3 kN/m^2 + Self weight). Compressive stress at transfer and working load are 14 Nimm^2 and 12 N/mm^2 tension is 1 N/mm^2 at all stages of loading loss Ratio 0.8. Determine number of 7mm diameter wires required if permissible tension is 1000 N/mm^2. Assume cover as 100 mm. **(16 Marks)**

Module_4

7 a. Explain types of shear cracks. **(04 Marks)**

b. A' PSC beam 250mm wide 150mm deep is subjected to SF 900 kN fiber stress under working load is 4 N/mm^2 effective pre-stress is 1000 N/mm^2 and area of cable is 1500 min$^-$. Design shear reinforcement slope of cable at support is (1/6). **(12 Marks)**

OR

8 A pre-stressed concrete beam of span 10m, cross section 120mm x 300mm is prestressed by a cable carrying a force of 180 kN the beam support a UDL 5 kN/m including self weight compare the magnitude of principal tension with and without axial pre-stress. Estimate the reduction in principal stress. Also find % reduction if a parabolic cable used with e = 50 mm at mid span and zero at support. **(16 Marks)**

Module_5

9 a. Explain stress distribution in End Block. **(04 Marks)**

b. Explain Indian Standard Code IS-1343 method for calculation of Burstire force. **(04 Marks)**

c. The end block of a post tensioned pre-stressed concrete beam 300mm x 300mm is subjected to a pre-stressing force 832.8 kN. Anchorage area 11720 mm^2. Design suitable anchorage reinforcement. **(08 Marks)**

OR

10 a. Explain composite construction in PSC members. **(06 Marks)**

b. A composite T beam is made up of pre tensioned web 100mm wide 200mm deep and a cast insitu slab 400mm wide 40mm thick having a modulus of elasticity 28 kN/mm^2. If the differential shrinkage is 100x 1 V' units determined shrinkage stresses developed in the precast and cast insitu units. **(10 Marks)**