CBCS SCHEME

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15CV82

Eighth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Design of Prestressed Concrete Elements

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS 1343-1980 is permitted.

Module-1

1 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 300×900mm. Flange 300×600mm 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^2 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 200×300mm 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 100×300mm 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 *l* 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 2×10^4 mm^2 radius of gyration 120mm. The beam support a two point load each 20 kN at middle third point E_c 38 kN/mm^2. Calculate (i) Short term deflection (ii) Long term deflection. Take $\phi = 2$, Loss of prestress 20%. **(10 Marks)**

Module-3

5 An unsymmetrical I section having top flange 750×200mm bottom flange 450×250mm 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 N/mm^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 mm^2. 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 × 300mm is prestressed by a cable carrying a force of 180 kN the beam support a UDL 5 kN/m including self weight compere 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 × 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 100×10^{-6} units determined shrinkage stresses developed in the precast and cast insitu units. **(10 Marks)**

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