Code No: **RT41012** **R13** **Set No. 1**

IV B.Tech I Semester Supplementary Examinations, February - 2019

PRESTRESSED CONCRETE

(Civil Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
Provide Code Book IS: 1343

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PART–A *(22 Marks)*

1. a) What are the applications of prestressed concrete? [4]
   b) Discuss the basic assumptions in analysis of prestress. [3]
   c) What are the losses present in post-tensioned member? [3]
   d) Discuss the factors influencing deflection. [4]
   e) Describe the shear and principal stresses. [4]
   f) Write notes on anchorage reinforcement. [4]

PART–B *(3x16 = 48 Marks)*

2. a) Discuss the need of high strength steel and high strength concrete. [8]
   b) Compare prestressed concrete with reinforced concrete. [8]

3. a) Explain the Freyssinet system of prestressing. [8]
   b) A box girder of pre-stressed concrete bridge of span 40m has overall dimensions of 1200mm by 1800mm. The uniform thickness of walls 200mm. The live load analysis indicates a maximum live load moment of 2000 kN at centre of span. The beam is pre-stressed by parabolic cables with an effective force of 7000 kN. The cables which are concentric at supports have an eccentricity of 800mm at centre of span section. Compute the resultant stresses at centre of span section using the internal resisting couple method. [8]

4. a) A pretensioned beam 250 mm wide and 360 mm deep is prestressed by 10 wires of 8mm dia. Initial stress to 1000N/mm^2. The centroid of the steel wires is located at 105mm from the soffit. Determine the max.stress in concrete immediately after transfer allowing elastic shortening of concrete only at the level of centroid of the steel. If however, the concrete is subjected to additional shortening due to the creep and shrinkage and the steel is subjected to relaxation of stress of 5% of initial stress. Find the final percentage of loss of stress in steel wires. Take E_s=210kN/mm^2, E_c=36.85kN/mm^2, ϕ=1.60, take residual shrinkage strain =3X10^{-4}. [8]
   b) Derive the loss due to elastic shortening of concrete. [8]

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5. a) A concrete beam having a rectangular section 100 × 300 mm is prestressed by a parabolic cable with an initial prestressing force of 240 kN. The cable has an eccentricity of 50 mm at the centre and concentric at the supports. If the span of the beam is 12 m and subjected to a live load of 5 kN/m. Calculate the short term deflection at midspan. Assume Ec = 38 kN/mm^2, creep coefficient = 2, loss of prestress = 20%. Estimate the long-term deflection. [8]
   b) Discuss the various methods of predicting long term deflections. [8]

6. a) A post-tensioned prestressed concrete Tee beam having a flange width of 1200 mm and flange thickness of 200 mm thickness of web being 300mm is prestressed by 2000 mm^2 of high tensile steel located at an effective depth of 1600mm. if f_{ck}= 40 N/mm^2 and f_p=1600 N/mm^2, estimate the ultimate flexural strength of the unbounded tee section assuming span/depth ratio as 20 and f_{pe}=1000 N/mm^2. [8]
   b) Explain the various modes of failure encountered in prestressed concrete beams subjected to bending, shear and torsion. [8]

7. a) Define End block. What is the transmission length? [10]
   b) What is the stress distribution in end block? Draw. [6]