7. A prestressed concrete beam is of unsymmetrical I section having top flange width and thickness 750 mm and 250 mm respectively. The bottom flange width and thickness are 500 mm and 250 mm respectively. The total depth is 1700 mm. Thickness of web is 200 mm. The area of prestressing steel is 1400 $mm^2$. The prestressing steel is provided at a distance of 100 mm from the soffit of the beam. If $f_{ck}$ = 40 MPa and $f_{pu}$ = 1700 MPa, calculate the ultimate flexural strength using IS CODE.

**Unit–IV** 15 each

8. The floor slab of an industrial structure spanning over 15 m is to be designed as a oneway pre-stressed concrete slab with parallel post-tensioned cables. The slab is required to support a live load of 10 $kN/m^2$ with the compressive and tensile stress in concrete at any stage not exceeding 14 and 2 $N/mm^2$ respectively. Design the suitable thickness for the slab and estimate the maximum horizontal spacing of prestressing cables (12 of 5 mm dia initially stressed to 1200 $N/mm^2$) and their position at mid span section. Take loss ratio as 0.8.

9. Explain the following :
   (a) Concordant Cable
   (b) Linear Transformation



*Roll No.* : .....

Total No. of Questions : **9** ] [ Total No. of Pages : **4**

# 3310

**B.Tech. (Civil) 6th Semester (Supplementary) Examination, July–2021**

*(G Scheme)*

**PRESTRESSED CONCRETE**

Paper–PEC-CEEL-310-G

**(Elective–II)**

*Time : **Three** Hours ]* *[ Maximum Marks : **75***

*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

***Note*** :– Attempt *five* questions in all, selecting *one* question from each Unit. Question No. **1** is compulsory. All questions carry equal (15) marks. Use of IS-1343 is allowed.

1. Explain the following :
   (i) Explain the principle of post tensioning.
   (ii) Explain the Type-I, Type-II and Type-III structures in pre-stressed concrete.

(iii) Draw a sketch showing the stress distribution in end block by double anchor plate.

(iv) What is the influence of differential shrinkage on composite prestressed concrete members ?

(v) Explain the importance of control of deflections of flexural members.

(vi) What are the different types of flexural failure modes ? 2½×6=15

**Unit–I**

2. (a) Define Prestressed concrete and bring out the differences between RCC and PSC.

(b) What are the design loads and material strength criteria concerning to limit state design ? Explain. 7½,7½

3. A prestressed concrete pile 250 mm square, contains 60 pre-tensioned wires, each of 2 mm diameter, uniformly distributed over the section. The wires are initially tensioned on the prestressing bed with a total force of 300 kN. Calculate the final stress in concrete and the percentage loss of stress in steel after all losses, given the following data :

$E_s$ = 210 kN/mm$^2$ and $E_c$ = 32 kN/mm$^2$

Shortening due to creep = $30 \times 10^{-6}$ mm/mm per N/mm$^2$ of stress



Total shrinkage = $200 \times 10^{-6}$ per unit length

Relaxation of steel stress = 5 per cent of initial stress

Prestressing force, P = 300 kN 15

**Unit–II**

4. (a) Explain the mechanism of shear failure in the beams.

(b) How do prestressed concrete beams behave in torsion ? 7½,7½

5. Determine the maximum short-term and the long term deflections of a pre-tensioned concrete beam of section 350 mm × 600 mm has an effective span of 16 m. The beam is prestressed by a parabolic cable carrying initial force of 700 kN at transfer. The cable is concentric at the supports and has an eccentricity of 150 mm at its mid-span. The beam is subjected to uniformly distributed live load of 15 kN/m in addition to two concentrated loads of 50 kN each at quarter span points respectively. Adopt M40 grade of concrete, loss of prestress as 20%, creep coefficient is 2 and the permanent load of the transverse load is 25%. 15

**Unit–III** 15 each

6. Explain the term end blocks. Write the steps involved in the design of end blocks by Guyon's method.