[Total No. of Questions - 9] [Total No. of Pr. d Pages - 3]
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**B. Tech 7th Semester Examination**

**Prestressed Concrete(NS)**

**CE-411(a)**

**Time : 3 Hours** **Max. Marks : 100**

*The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.*

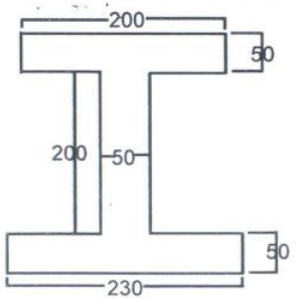
**Note :** Attempt one question each from Sections A, B, C and D. Section E is compulsory. All questions carry equal marks. Use of IS: 1343-1980 is allowed. Assume any missing data suitably.

## SECTION - A

1. State advantages of prestressed concrete over RCC. Why high strength concrete and high strength steel is required? (20)
2. List the various methods of prestressing and explain with sketches the Freyssinet system of post-tensioning. (20)

## SECTION - B

3. Draw the stress distribution across the mid span at transfer and at service for the beam as shown below. All the dimensions are in mm. The beam is prestressed with 50 nos. of 8 mm diameter wires with an eccentricity of 100 mm at mid span and zero at supports. Assume the cable as parabolic. Initial prestress is 1050 N/mm$^2$. The beam is simply supported over a span of 12 m and carries a live load of 15 kN/m. (20)






4. A post tensioned concrete beam of 20 m span, 200mm wide and 400mm deep, is prestressed by 3 cables. The cross sectional area of each cable is 200 mm$^2$ and the initial stress in cable is 1200 N/mm$^2$, modular ratio = 6. The 1st cable is parabolic with an eccentricity of 50mm below the centroid at center of span & 50mm above centroid at support section. The 2nd cable is parabolic with zero eccentricity at supports & 50mm below the centroid at center of span. The 3rd cable is straight with uniform eccentricity of 50mm below centroid. If the cables are tensioned successively from the ends only, calculate the percentage loss of stress in each cable. (20)

## SECTION - C

5. A post tensioned prestressed beam of rectangular section 250 mm wide is to be designed for an imposed load of 12kN/m, uniformly distributed on a span of 12m. The stress in concrete must not exceed 17 N/mm$^2$ in compression or 1.4 N/mm$^2$ in tension at any time and the loss of prestress may be assumed to be 15%.

   (a) Calculate the minimum possible depth of the beam.

   (b) For the section provided, calculate the minimum prestressing force and the corresponding eccentricity. (20)

6. A pretensioned prestressed concrete beam having a rectangular section, 150 mm wide and 350 mm deep, has an effective cover of 50 mm. If fck= 40 N/mm$^2$, fp= 1600 N/mm$^2$, and the area of prestressing steel Ap = 461 mm$^2$, calculate the ultimate flexural strength of the section using IS: 1343 code provisions. (20)

## SECTION - D

7. The cross-section of a composite beam is of T-section having a pretensioned rib, 80 mm wide and 240 mm deep, and an in situ cast slab, 350 mm wide and 80 mm thick. The pre-tensioned beam is reinforced with eight wires of 5 mm diameter with an ultimate tensile strength of 1600 $N/mm^2$, located 60 mm from the soffit of the beam. The compressive strength of concrete in the in situ cast and precast elements is 20 and 40 $N/mm^2$ respectively. If adequate reinforcements are provided to prevent shear failure at the interface, estimate the flexural strength of the composite section. (20)

8. A concrete girder of unsymmetrical I-section used for a bridge spans over 30 m and its self weight is 10.8 kN/m. The girder is prestressed by a parabolic cable having an eccentricity of 580 mm at centre of span and 170 mm at supports towards the soffit of the girder. The initial force in the cable is 3200 kN. If loss ratio is 0.85 and the creep coefficient is 1.6, modulus of elasticity of concrete is 34 $kN/mm^2$, estimate the long term deflection of the bridge girder and compare it with the permissible deflection as per IS: 1343 code specifications. Assume second moment of area as 72490 × 106 $mm^4$ and live load is 9 kN/m. (20)

## SECTION - E

9. Describe following any five of following.

   (a) Thermo-elastic prestressing.

   (b) Concordant cable profile.

   (c) Transmission Length.

   (d) End Block.

   (e) Hoyer's Effect in pretensioned members.

   (f) Factors influencing deflection of prestressed concrete members. (5×4=20)