Code No: NR410110 **NR**

IV B.Tech I Semester Supplementary Examinations, April/May 2005
PRE-STRESSED CONCRETE
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are general principles of prestressing.
   (b) Explain in detail about pretressing and post tensioning.

2. (a) A post-tensioned concrete bema of rectangular cross section 110mm wide and 300mm deep is stressed be a parabolic cable with zero eccentricity at the supports and an eccentricity of 45mm at the centre of the span. The cross sectional area of the cable is 200mm^2. Take E_{Steel} = 206 kN/mm^2, $E_{Concrete}$= 35 kN/mm^2. Age of concrete at the time of loading = 28 days. The initial stress in cable is 1200MPa. Find the loss of stress due to creep of concrete.
   (b) A concrete beam is prestressed by a cable carrying an initial prestressing force of 335kN. The cross sectional area of wires is 320mm^2. Calculate the percentage loss of stress in the cable only due to shrinkage of concrete using IS 1343 recommendations assuming the beam to be
      i. Pre-tensioned.
      ii. Post-tensioned.

   Take E_{Steel} = 210 kN/mm^2. Age of concrete at the time of transfer = 10 days.

3. An unsymmetrical cantilever prestressed concrete beam has the following dimensions.
   Top flange : 320mm wide and 80mm thick.
   Web: 80mm thick and 260mm deep.
   Bottom flange: 250mm wide and 80mm thick.
   Span of the beam = 6m
   Live load = 10 kN/m
   Cross-sectional area of wires = 360mm^2
   Final stress in the wires = 1200 MPa.
   Determine the eccentricity at which the prestress should be applied so that a net residual compressive stress of 4 MPa is present at mid span under full live load. Concrete weighs 25 kN/m^3.

4. A rectangular beam 200 × 450mm has a span of 10 metres. The prestressing cable has a trapezoidal cable with zero eccentricity at the ends and 70mm at one third span points. The effective prestress is 750kN after all losses. Determine the value of equal point loads the beam can support at the one third points if the pressure line passes through the upper kern of the section.

5. A post tensioned bonded beam of rectangular cross section is required to carry a factored moment of 1500 KNm. Determine the preliminary cross sectional dimensions is σck = 45 Mpa and σp = 1600 Mpa.

6. A Post tensioned concrete beam having end section of 500mm by 1000mm is provided with two cables of 250kN each. The two cables are spaced at 150mm on either side of the centroid of the beam with 45 degree inclination. Design the anchor plates, the bursting and spalling reinforcement.

7. The cross section of a composite beam which consists of a 300mm $\times$ 900 mm precast stem and a cast-in-situ flange 900 mm $\times$ 150 mm. The stem is a post-tensioned unit with an initial prestressing force of 2200 kN. The effective prestress available after making deduction for losses, is 2000 kN. The dead load moment due to the weight of the flange is 120 kNm. After the hardening of the flange concrete, the composite section has to carry a live load, which produces a bending moment of 700 kNm. Determine the stress in concrete at various stages of loading.

8. (a) State the approximate procedure suggested by 'LIN' in computing long time deflections.

   (b) A concrete beam long a rectangular section of 120mm wide and 280mm deep is prestressed by a parabolic cable carrying an initial force of 200kN. The cable has an eccentricity of 60mm at the centre of span and is concentric at the supports. If the span of the beam is 10m and the live load in 10kN/m estimate the short time deflection the centre of span. Assuming E=38kN/mm^2 and creep coefficient $\phi = 2.0$ loss of prestress = 20% of the initial stress after 6months, estimate the long time deflection and the centre of the span assuming that the dead and live loads are simultaneously applied after the release of prestress.

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