Code No. 6040 / O

FACULTY OF ENGINEERING

B. E. 4/4 (Civil) I – Semester **(Old)** Examination, July 2010

Subject : **Prestressed Concrete**
(Elective – I)

Time : 3 Hours} {Max. Marks: 75

Note: Answer **all** questions of Part - A and answer any **five** questions from Part-B.

PART – A (25 Marks)

1. 'It is possible to use this webs in flanged prestressed concrete section as compared to stocky webs of reinforced concrete sections". Why ? (2)

2. What are the purposes of grouting ? (2)

3. "The total residual shrinkage strain will be large in pre-tensioned members in comparison with post-tensioned members". Why ? (2)

4. What do you mean by creep of steel ? (2)

5. What are the remedial measures to reduce loss of prestress due to friction ? (2)

6. Sketch the cable profile for a cantilever beam subjected to a uniformly distributed load. (3)

7. Sketch the variation of resultant stresses, if the pressure line coincide with the top kern of a beam. (3)

8. "Is 1343 : 1980 recommends that one half of the transmission length shall overhang the support in simply supported beams and the whole of the transmission length should extend beyond the supports in the case of fixed ends". Why? (3)

9. Sketch the stress distribution in the end blocks. (3)

10. What do you mean by concordant cable profile ? (3)

PART – B (5x10=50 Marks)

11. A post-tensioned cable of a beam 10m long is initially tensioned to a stress of 1000 N/mm^2 at one end. If the tendons are curved so that the slope is 1 in 15 at each with an area of 6000 mm^2, calculate the loss of prestress duet to friction, given the following data :

    Coefficient of friction between duct and cable = 0.55
    Friction coefficient for wave effect = 0.0015 /m
    During anchoring, if there is a slip of 3mm at the jacking end, calculate the final force in the cable and the percentage loss of prestress due to friction and slip.

12. A prestressed concrete beam is having a T-section with the following details : Flange : 1200mm x 200mm ; Web : 240mm x 1000mm. It carries a udl of 12KN/m inclusive of self-weight at the initial stage over a span of 16m

13. A simply supported concrete beam of span 8m and rectangular cross-section 125mm wide and 250mm deep, is prestressed by a single cable in which the total tensile force is 220 kN. The center line of the cable is parallel to the axis of the beam and 75mm above the soffit over the middle third of the span and is curved upward in a parabola over the outer-thirds of the span to a distance of 175mm above the soffit at the supports. If the modulus of elasticity of concrete is 35 kN/mm^2 and the density of concrete is 24 kN/m^3, Calculate :
(a) The upward deflection at the mid-span due to prestress only.
(b) The deflection when the beam is supporting its own weight, and
(c) The magnitude concentrated loads 'Q' placed at the third points of the span, which would result in a limiting short-term deflection of span/500.

14. Design a rectangular section for a pretensioned beam for an industrial shed. The effective span is 15m. The beam carries only its own weight at stress transfer. It has to carry a superimposed load of 4.2 kN/m at the final stage. Concrete is of m-40 grade. The strength of concrete at stress transfer = 30 N/mm^2. The ultimate tensile strength of high tensile steel = 1600 N/mm^2. The beam has to be of type-1. Take working stresses pertaining to zone 1 as per IS code.

15. The support section of a prestressed concrete beam, 100mm wide and 250mm deep, is required to support an ultimate shear force of 80 kN. The compressive prestress at the centridal axis is 5 N/mm^2. The cover to the tension reinforcement is 50mm. If the characteristic tensile strength of strimps is 415 N/mm^2, design suitable sheer reinforcement in the section as per IS code.

16. The end block of a prestressed concrete beam, rectangular in section, is 120mm wide and 300mm deep. The prestressing force of 250kN is transmitted to concrete by a distribution plate, 120mm wide and 75mm deep, concentrically located at the ends. Calculate the position and magnitude of the maximum tensile stress on the horizontal section through the center of the end block by Guyon's method. Design the reinforcement for the end block for the maximum transverse tension.

17. A prestressed concrete T-beam is to be designed to support an imposed load of 4.4 kN/m over an effective span of 5m. The T-beam is made up of a flange 400mm wide and 40mm thick. The rib is 100mm wide and 200mm deep. The stress in the concrete must not exceed 15 N/mm^2 in compression and zero in tension at any stage. Check for the adequacy of the section provided and calculate the minimum prestressing force necessary and the corresponding eccentricity.

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