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M.Tech. (Structural Design) (2016 & Onwards) (Sem.–1)
PRE-STRESSED CONCRETE DESIGN
Subject Code : MTSD-103
M.Code : 74244

Time : 3 Hrs.   Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :

1. Attempt any FIVE questions out of EIGHT question.
2. Each question carry TWENTY marks.
3. Wherever possible support the answer with suitable sketches.
4. Symbols and terms are to be read in context of the subject
5. Missing data if any can be suitably assumed, clearly stating the same.
6. Use of relevant IS Code allowed (IS 1343 etc.)

1. a) What is the advantage taken of special manufacturing techniques of concrete in Prestressed Concrete?

    b) Explain the necessity of using bent cables. Define the cable zone by giving its upper and lower bound limits.

2. a) A concrete beam 120 mm wide and 300 mm deep is prestressed by a straight cable carrying an effective force of 180 kN at an eccentricity of 50 mm. The beam spans 6m & carries udl of 4kN/m (including self weight). The initial stress in the tendon is 1000 Nmm^{-2}. Determine the percentage increase of stress in the tendon due to the loading on the beam. Take E_s = 210 kN/mm2 and E_c = 35 kN/mm2 .

    b) Explain the concept of Load Balancing in prestressed concrete members.

3. a) "IS 1343 specifies different strains for pretensioned & post-tensioned members." Explain with reasons.

    b) A beam of 120mm × 300 mm is prestressed by a straight cable carrying an effective force of 180 kN at an eccentricity of 50 mm. The beam supports an imposed load of 4kN/m over a span of 6m. If modulus of rupture of concrete is 5MPa, evaluate the load factor against cracking assuming self-weight of concrete = 24 kN/m3.

4. a) Discuss the behavior of an end block of a prestressed concrete beam. Outline the principle of designing the end block.

    b) The horizontal prestress at the centroid of a concrete beam of 120 mm × 250 mm is 7MPa and the maximum shearing stress on the beam is 70 kN. Calculate the maximum principal tensile stress. What is the minimum vertical stress required to eliminate this principal tensile stress?

5. a) Briefly outline the strain compatibility method of computing the flexural strength of concrete beams with tension and compression reinforcement.

    b) What are class-3 type or partially prestressed members? Mention their advantages.

6. a) Explain the theoretical basis of selecting the preliminary dimensions for thickness of web in prestressed beams with short and long spans.

    b) List the factors influencing the width of cracks in prestressed concrete members.

7. a) Outline the various methods by which bond between concrete and steel tendons can be improved.

    b) Briefly outline the skew bending theory and space truss analogy w.r.t. design of reinforcements in prestressed sections subjected to combined moment, shear & torsion.

8. a) How do you estimate the ultimate shear strength of prestressed concrete sections with web shear cracks.

    b) In terms of strength, economy and serviceability, compare RCC with PSC.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.