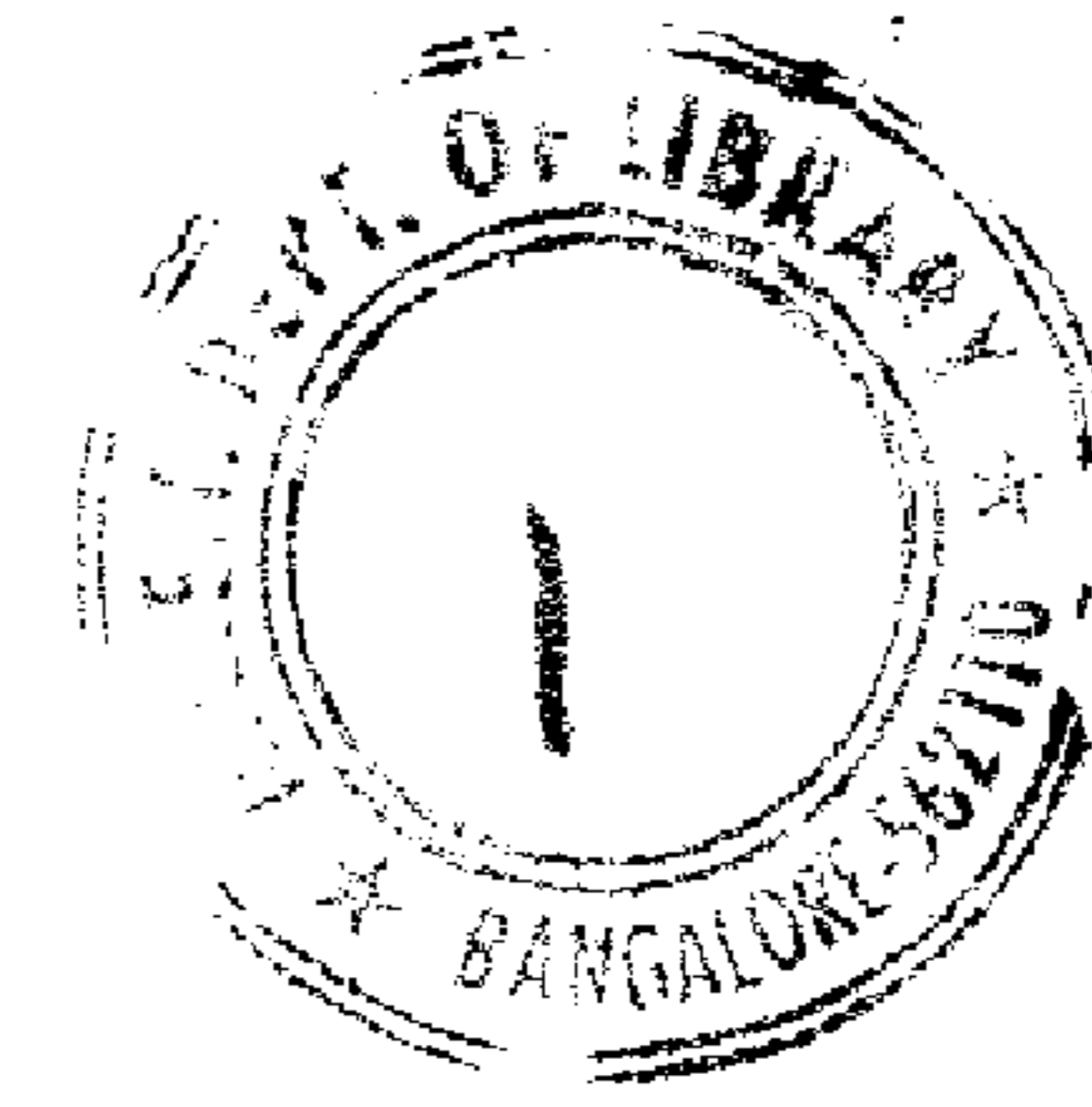


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06CV74

Seventh Semester B.E. Degree Examination, Dec.09/Jan.10
Design of Pre-Stressed Concrete Structures

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, selecting at least TWO questions from each part.
2. Use of IS1343 permitted.

PART – A

- 1 a. Distinguish between pre-tensioning and post-tensioning. (08 Marks)
 b. Explain why high strength steel and high strength concrete are used in pre-stressed concrete. (06 Marks)
 c. Explain with a neat sketch "Hoyer's long line" system of pre-tensioning. (06 Marks)
- 2 a. What is pressure line? Explain its significance. (04 Marks)
 b. A cantilever beam of span 5m is 240 x 500 mm in section. It carries udl of 4 kN/m together with a point load of 10 kN at 4m from fixed end in addition to its own weight. Find the initial prestress and its eccentricity, so that tension in concrete is not to exceed 0.8 N/mm² and 0.5 N/mm² at transfer and working load respectively. Take the loss ratio as 80% and weight of concrete as 24 kN/m³. (16 Marks)
- 3 a. How do you estimate the loss of prestress due to :
 i) Elastic deformation
 ii) Shrinkage
 iii) Creep of concrete
 iv) Relaxation of steel. (08 Marks)
 b. A post tensioned simply supported beam of 8m span is provided with a curved cable of area 800 mm² with a slope of 1 in 20 at each end and is initially stressed to 1200 N/mm². Youngs modulus of elasticity is 210 kN/mm². Calculate:
 i) The loss of prestress due to friction if the coefficients of friction between duct and cable is 0.5, wave effect = 0.0015/m.
 ii) The loss due to slip of 2mm at the tacking end during anchoring.
 iii) The final force in the cable and percentage loss of prestress due to friction and slip. (12 Marks)
- 4 a. What are the factors affecting deflection in PSC beams and slabs? (06 Marks)
 b. A prestressed concrete beam of rectangular section 120 mm wide and 300 mm deep span over 6 m. The beam is prestressed by a straight cable carrying an effective force of 180 kN at an eccentricity of 50 mm. It supports an imposed load of 4 kN/m and the modulus of concrete is 36 kN/mm². Compute the deflection at the following stages and check whether they comply with the IS code specifications:
 i) Prestress + self weight
 ii) Prestress + self weight + imposed load including the effect of creep and shrinkage. Assume the creep coefficient to be 1.8. (14 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART - B

- 5 a. What are the different types of flexural failure modes observed in PSC beam? Explain failure of under-reinforced sections. (08 Marks)
- b. A post tensioned beam with unbonded tendons is of rectangular section, 400 mm wide with an effective depth of 800 mm. The cross sectional area of the pre-tensioning steel is 2840 mm^2 . The effective prestress in the steel after all losses is 900 N/mm^2 . The effective span of the beam is 16m. $f_{ck} = 40 \text{ N/mm}^2$, estimate the ultimate moment of resistance of section using IS1343 recommendations. (12 Marks)
- 6 a. Write a note on limit state of serviceability. (06 Marks)
- b. Using Fe 415 reinforcements, design the shear reinforcements using IS recommendation for the following data. $B = 200 \text{ mm}$; $D = 300 \text{ mm}$; $V_u = 180 \text{ kN}$; $F_{ck} = 40 \text{ N/mm}^2$. Effective cover = 50 mm, compressive stress = 5 N/mm^2 . (08 Marks)
- c. What are the ways of improving the shear resistance of structural concrete members by prestressing techniques? (06 Marks)
- 7 a. What is transmission length? List the factors influencing transmission length. (04 Marks)
- b. Explain end zones reinforcements. (04 Marks)
- c. A PSC beam 300 mm wide and 500 mm deep has 2 anchorages of 150 mm diameter with the center at 125 mm from top and bottom of the beam. The force transmitted by each cable is 800 kN. Estimate the maximum tension and bursting force. (12 Marks)
- 8 a. Write a short note on limiting zone for cables in PSC beam. (04 Marks)
- b. A pretensioned PSC concrete beam of rectangular section is required to support a design ultimate moment of 100 kN-m. Design the section if f_{ck} is 50 N/mm^2 and $f_p = 1600 \text{ N/mm}^2$. (16 Marks)
