CBCS SCHEME

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18CV81

Eighth Semester B.E. Degree Examination, June/July 2024
Design of Pre-Stressed Concrete

Time: 3 hrs. Max. Marks: 100

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Assume and indicate missing data, if any.***

Module-1

1 a. Explain why high strength street and high strength concrete are used in pre-stressed concrete. **(10 Marks)**

b. Explain with a neat sketch, "Hoyer's line" system of pre-tensioning. **(10 Marks)**

OR

2 a. Explain pressure line concept. **(10 Marks)**

b. A beam of symmetrical I section spanning 12m has a flange width of 300mm and thickness 80mm. The web depth is 80mm. The overall depth of the beam is 800mm. The parabolic cable has an eccentricity of 300mm at the centre and zero eccentricity at the end and it carries an initial pre-stressing force of 150kN. The live load on the beam is 3.5kW/m Assuming a loss of 20% by strength concept, calculate the stress at the mid span section during the transfer of pre-stress and working load condition. Assume density of concrete as $25kN/m^3$. **(10 Marks)**

Module-2

3 a. List and explain the various losses in pre-stressed concrete. **(06 Marks)**

b. A pre-stressed concrete beam of size 200mm × 300mm is pre-stressed with $A_s = 160mm^2$ to an initial pre-stresses of $1000N/mm^2$ at a constant eccentricity of 50mm. The beam spans 10m. Calculate the percentage pre-stresses loss if the beam is post tensioned considering the wires simultaneously tensioned. $E_s = 210\ kN/mm^2$, $E_c = 35kN/mm^2$ relation of stress in steel is 5% of initial stress, Shrinkage of concerts is 200×10^{-c}, slip and deformation is 2.0, wobble co-efficient = 0.0015/m. **(14 Marks)**

OR

4 a. Discuss the various factors affecting affecting in pre-stressed concrete beams. **(08 Marks)**

b. A concrete beam with a cross sectional area of $32 \times 10^3 mm^3$ and radius of gyration of 72mm in pre-stressed by parabolic cable carrying an effective stressed by a $1000N/mm^2$. The span of the beam is 3m. The cable composed of 6 wires of 7mm diameter has an eccentricity of 650mm at the centre and zero at the supports neglecting all losses, find the central deflection of the beam for the following cases. Assume : $E_c = 38kN/mm^2$, Density = $24kN/m^3$.

i) Self weight + Pre-stresses

ii) Self weight + pre-stress + live load of 2kN/m. **(12 Marks)**

Module-3

5 a. List the different types of flexural failures in a PSC beam. Explain failure of over reinforced sections. **(06 Marks)**

b. A post tensioned bridge girder with unbounded tendons is of base section of overall dimensions 1200mm wide by 1800mm deep with wall thickness of 150mm. The high tensile steel has an area of $4000mm^2$ and its located at an effective depth of 1600mm. The effective pre-stress in steel after tosses is $1000N/mm^2$ and the effective span of the girder is 24m. If $f_{ck} = 40N/mm^2$ and $f_p = 1600N/mm^2$. Estimate the ultimate flexural strength of the section. **(14 Marks)**

OR

6 Design a symmetrical I section of span 16m to carry superimposed load of 18kN/m. Assume compressive stress of concrete as 15MPa at transfer and 12MPa at working load. The permissible tensile stress in concrete at both the stages of loading are 1MPa. Assume the loss of pre-stresses 20% and the initial pre-stress in steel shall not exceed 5000MPa. **(20 Marks)**

Module-4

7 a. Explain the different types of share failure cracks. **(06 Marks)**

b. A simply supported beam of span 6m is 120 × 300mm is section. It is pre-stressed with parabolic cable which carries an effective pre-stress of 200kN. The cable has a maximum eccentricity of 100mm at mid span section and minimum eccentricity of 50mm at the support section. Determine the principle tension at 20mm above the centriodal fibre in a section. Determine which lies at 0.6m from the left support. The beam carries an all inclusive load of 15kN/m. **(14 Marks)**

OR

8 a. Explain the following i) Diagonal Tension failure ii) Shear compression Failure. **(08 Marks)**

b. The support section of PSC beam 150mm × 300mm deep is required to support an ultimate shear force of 100kN. Compressive pre-stress at the centriodal axis is 5N/mm^2. Adopt M40 grade concrete and cover to tension reinforce as 45mm. Design suitable reinforcements at the section using IS : 1343 recommendations. Use 8mm ϕ 2 legged vertical stirrups. Take f_y = 250N/mm^2. **(12 Marks)**

Module-5

9 a. Explain the stress distribution in end block of a post tensioned pre-stressed concrete member with neat sketch. **(06 Marks)**

b. The end block of a PSC girder is 200mm by 300mm. The beam is post-tensioned – tensioned by 2 anchorages each of 100mm diameter with their centers located at 75mm from the top and bottom of the beam. The force and design suitable reinforcements according to IS : B43 provision. Also sketch the arrangement of anchorage zone reinforcement use : 10# links yield stress. **(14 Marks)**

OR

10 a. Explain the factors effecting of End block stress distributions. **(06 Marks)**

b. The end block of a pre-stressed concrete girder is 200mm wide by 300mm deep. The beam is post tensioned by two Freyssient an charges each of 100mm diameter with their centers located at 75mm from the top and bottom of beam. The force transmitted by each anchorage being 2000kW. Compute the bursting force and design suitable reinforcements according to Indian standard IS1343 code provisions. Sketch the arrangement of anchorage zone reinforcement. **(14 Marks)**

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