CMRIT Library

ONE TIME EXIT SCHEME

USN | | | | | | | | | |

CMRIT LIBRARY
BANGALORE - 560 037

10CV74

Seventh Semester B.E. Degree Examination, April 2018
Design of Prestressed Concrete Structures

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Use of IS : 1343 is permitted.
3. Assume any missing data suitably.

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 – A

1 a. Explain the principle of Prestressing. **(04 Marks)**

b. Differentiate between bonded and unbounded members in PSC. **(08 Marks)**

c. Explain with a neat sketch, "Hoyer's Long Line", system of pre-tensioning. **(08 Marks)**

2 a. A PSC beam of rectangular section 400mm width and 600mm deep is provided with a tendon having a parabolic cable with an eccentricity of 100mm at the centre. If the total external load on the beam is 35kN/m on the whole span, calculate the extreme fiber stresses for the mid span section using Load Balancing Method. The tendon carries a prestressing force of 1000kN. **(08 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 prestressing force of 150kN. The live load on the beam is 3.5kN/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 $25kN/m^3$. **(12 Marks)**

CMRIT LIBRARY
BANGALORE - 560 037

3 a. List different losses of prestress in PSC members. **(06 Marks)**

b. A post tensioned concrete beam 250mm × 400mm is prestressed by 12 wires of 7mm diameter initially stressed to $1200N/mm^2$. The profile of the cable is parabolic with zero eccentricity at supports and 120mm at the centre. Estimate the loss in prestress due to various / actors and also the percentage loss for the following data : Span = 10m , $f_{ck} = 40N/mm^2$, $E_s = 2 \times 10^5\ N/mm^2$, relaxation of stress in steel = 4% , shrinkage strain = 3×10^{-4} , creep coefficient = 1.6 , co-efficient of friction between cable and duct , $\ell_e = 0.55$, friction coefficient for wave effect, K = 0.0015/m length , anchorage slip = 3mm, $E_c = 36 \times 10^3\ N/mm^2$. Assume all cables are tensioned and prestressed simultaneously. **(14 Marks)**

4 a. List the factors influencing deflection of a PSC beam. **(06 Marks)**

b. A prestressed concrete beam 120mm × 300mm deep , spans over 6m. The beam is prestressed by a straight cable carrying an effective force of 180kN at an e = 50mm. If the beam supports an imposed load of 4kN/m and $E_c = 38kN/mm^2$, compute the deflection at the following stages and check if they comply with the IS code specifications.
i) Upward deflection under (prestress + self weight) and ii) Final downward deflection under (prestress + self weight + imposed load) including the effects of creep and shrinkage. Assume creep coefficient = 1.8. Take Self weight, $w_g = 0.86$ N/mm. **(14 Marks)**

CMRIT LIBRARY
BANGALORE - 560 037

CMRIT Library

CMRIT LIBRARY
BANGALORE - 560 037

PART – B

5 a. Explain the flexural failure of an under reinforced PSC section. **(05 Marks)**

b. A post tensioned bonded PSCT – beam has flange width of 1500mm and flange thickness 175mm. Thickness of the rib is 300mm. Area of steel is $5000mm^2$, located at an effective depth of 1800mm. If $f_y = 1600N/mm^2$ and $f_{ck} = 40N/mm^2$, calculate the flexural strength of the section. **(15 Marks)**

6 a. A PSC beam having unsymmetrical I – section has a fiber stress distribution of $13N/mm^2$ (compression) at the top edge linearly reducing to zero at the bottom. The top fange width and thickness are 2400mm and 400mm respectively, the bottom flange width and thickness are 1200mm and 900mm respectively and the depth and thickness of the web are 1000mm and 600mm respectively. The total service load shear in the concrete at the section is 2350 kN. Compute and compare the principal stresses at the centroidal axis and at the junction of the web with the lower flange. Assume the tendon to be straight. **(10 Marks)**

b. The support section of a PSC beam 150mm × 300mm deep is required to support an ultimate shear force of 100kN. Compressive prestress at the centroidal axis is $5N/mm^2$. Adopt M40 grade concrete and cover to tension reinforcement as 45mm. Design suitable reinforcements at the section using IS : 1343 recommendations. Use 8mm ϕ 2 legged vertical stirrups. Take $f_y = 250N/mm^2$. **(10 Marks)**

7 a. What is transmission length? List the factors affecting transmission length. **(04 Marks)**

b. The end block of a P.S.C girder is 200mm by 300mm. The beam is post – tensioned by 2 anchorages each of 100mm diameter with their centers located at 75mm from the top and bottom of the beam. The force transmitted by each anchorage is 2000kN. Compute the bursting force and design suitable reinforcements according to IS : 1343 provisions. Also sketch the arrangement of anchorage zone reinforcement. Use : 10 ϕ links , Yield stress of steel = $260 N/mm^2$. **(16 Marks)**

8 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 prestress as 20% and the initial prestress in steel shall not exceed 1000MPa. **(20 Marks)**

CMRIT LIBRARY
BANGALORE - 560 037

*****