R18

Code No: 156CN

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, August/September - 2021

PRESTRESSED CONCRETE

(Civil Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions

All questions carry equal marks

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1. Explain load balancing concept in prestressed concrete. [15]
2. Explain why high strength steel and high strength concrete is needed in PSC. [15]
3. A post tensioned concrete beam of 100 mm wide and 300mm deep spanning over 10m is stressed by successive tensioning and anchoring of three cables 1, 2 and 3 respectively. The cross sectional area of each cable is 200mm^2, initial stress in the cable is 1200 N/mm^2 and m = 6. The first cable is parabolic with the eccentricity 50 mm below centroidal axis at the centre of span and and the 50mm above the centroidal axis at support sections. The second cable is parabolic with zero eccentricity at the support and an eccentricity of 50mm at the centre of span. The third cable is straight with uniform eccentricity of 50mm below centroidal axis. Estimate the percentage loss of stress in each of the cables if they are successively tensioned and anchored. [15]
4. A post tensioned simply supported beam of 8m span is provided with a curved cable of area 800 mm^2 with a slop of 1 in 20 at each end and is initially stressed to 1200 m^2. $E = 2 \times 10^5$ N/mm^2. Calculate
   a) The loss of prestress due to friction if the coefficient of friction between duct and cable is 0.5, wave effect = 0.0015/m
   b) The loss due to slip of 2mm at the tacking end during anchoring. The final force in the cable and percentage loss of pretress due to friction and slip. [8+7]
5. A PSC beam 250mm wide and 1500mm deep carries an effective pre-stressing force of 1362kN. Shear force at a section under working load is 771kN. Effective pre-stress at the function is taken to be acting at an angle of $\sin^{-1}$ 1/6 with horizontal. The external fibre stress is 7N/mm^2 at top and zero at bottom. If tensile stress is 0.7N/ mm^2. Find the spacing of 12mm vertical stirrups. Assume all the tension in concrete is to be carried by the stirrups. [15]
6. The support section of a PSC beam 300 × 600mm is to resist shear 150kN. The prestress at centroidal axis is 5 N/mm^2 Fck = 40N/mm^2. The cover to tension reinforcement is 45mm. Check the section for shear and design suitable shear reinforcement. f_t =1.5N/mm^2. [15]

7. The end block of PSC beam 250 mm wide and 500mm deep in section is prestressed by 2 cables caring force of 500KN each. One of the cable is parabolic, located 125 mm below at the centre of span 10m and anchored at a point 125 mm above the centre line at the ends. The second cable is straight located 100 mm from the bottom of the beam. The distribution plate for the cables are 100 mm deep and 250mm wide. Calculate the maximum tensile stress along the axis of the beam using IS code method. [15]

8. A rectangular concrete beam of cross section 300mm wide and 600mm deep is simply supported over a span of 8m. it is prestressed by means of symmetric parabolic cable at a distance of 120mm from the bottom fibre at mid span section. Initial prestress in the cable is 350kN.
Determine
a) Maximum deflection of the beam at transfer.
b) Central concentrated force to be applied to nullify the above deflection.
Take $E_c = 38kN/mm^2$ [15]

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