Seat NO

BE CIVIL / SEM-VII / CBCS

N.B.:

MARKS: 80

1. **Q.1 is compulsory**
2. Attempt any **three** question out of remaining **five**
3. Assume **suitable** data if **required**
4. Use of **IS 1343:2012** is permitted.

Q.1 Attempt any four **20**

(A) Explain the need of providing high strength steel and concrete in prestressed concrete structures

(B) Explain safe cable zone or zone of prestress with neat sketch

(C) Explain Fryssinet or Magnel blaton method of prestressing with neat sketch

(D) Differentiate between pre-tensioning and post-tensioning of prestressed concrete structure?

(F) Enlist and explain various modes of failure of prestressed concrete beam in flexure

Q.2 (a) Explain concept of load balancing with neat sketch, a simply supported prestressed concrete beam of span 4m is subjected to a u.d.l. of 10KN/m inclusive of its self- weight, the cable is located at an eccentricity of 45mm. Determine the shift of pressure line using following data: area of prestressing wires = 320mm^2, initial stress in wires = 1000N/mm^2 **10**

(b) Define kern points and derive equation for upper and bottom kern points, find the efficiency of a T-section: flange 500×200mm web 750×100mm overall depth = 950mm **10**

Q.3 (a) Differentiate between losses incurred in pre-tensioning and post tensioning **5**

(b) A post tensioned beam of rectangular section 200mm x 450mm is prestressed by a cable made up of 12-8mm wires. Cable is located at 100mm from soffit of the beam at mid span and it is concentric at supports. The wires are initially stressed to 1100 Mpa. Calculate loss of stress and loss of strain in steel. Jacking force is applied from one end only. Take $\mu = 0.15$, K= 0.0066/m, anchorage slip = 2mm, span =6m simply supported, Es = 210 kN/mm^2, Ec = 35 kN/mm^2, Shrinkage strain in concrete (ε_{ca}+ **15**

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$\varepsilon_{cd}) = 300x10^{-6}$. Creep coefficient 1.6, $f_p = 1500MPa$, consider normal relaxation loss of stress in steel.

Q.4 (a) A prestressed concrete beam 150mm wide and 400mm deep of span 10m which is simply supported in nature is subjected to a live load of 5KN/m. A prestressing force of 180KN is applied at an eccentricity of 50mm. Take density of concrete and characteristic strength of concrete as $24KN/m^3$. Assuming a loss ratio of 0.85.charactristic compressive strength of concrete is 40Mpa design the beam for shear. 10

(b) A prestressed concrete beam of section 200mm wide and 350mm deep is used over an effective span of 8m to support an imposed load of 5KN/m. The density of concrete is $24KNm^3$. At the centre of span section of the beam, find the magnitude of 10

(i) the concentric prestressing force necessary for zero fibre stress at the soffit when the beam is fully loaded

(ii) the eccentric prestressing force necessary located 100mm from the bottom of the beam which would nullify the bottom fibre stresses due to loading.

Q.5 (a) Explain in brief about autogenous shrinkage and drying shrinkage strain in concrete 5

(b) A prestressed concrete beam having a cross sectional area of $3x\ 10^4\ mm^2$ is simply supported over a span of 10m. It supports a uniformly distributed imposed load of 3kN/m, Half of which is not permanent. The tendons follow a trapezoidal profile with an eccentricity of 100mm with in the middle third of the span and vary linearly from the third span points to zero at the supports. The area of the tendons $Ap=350mm^2$ having a effective prestressed of $1290N/mm^2$ immediately after transfer. Calculate the short term and long term deflection. 15

Q.6 (a) Derive the expression for sectional moduli and corresponding prestressing force based on fundamental equations of service and transfer stage 10

(b) A post tensioned beam of rectangular section having a span of 10m is subjected to a uniformly distributed load of 15KN/m. The width of the section being 250mm,

loss ratio may be assumed as 0.85.If the sectioned needs to be design considering as zone1 element & stresses in concrete should not exceed 15N/mm^2 in compression in any case determine (i) depth of the beam (ii) check adequacy of section modulus (iii) prestressing force

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