

QP Code : 31466

(3 Hours)

[Total Marks : 80

N.B.: 1) Question no. 1 is compulsory, maximum duration 3hrs

2) Solve any three from remaining five questions.

3) Assume suitable data if required.

4) Use of IS-1343 is permitted.

1. A

- (a) The grade of concrete for prestressed members should be in the range of **1**
i. M-20 to M-30 ii. M-80 to M-100 iii. M-30 to M-60
- (b) In a concrete beam subjected to prestress, dead and live loads the pressure line **1**
i. shifts more at centre span and zero at support ii. Coincide with the cable line
iii. shifts uniformly towards top of beam as load increases
- (c) Short term deflection of a prestressed beam can be computed using **1**
i. three moment theorem ii. Mohr's theorem iii. Moment distribution method
- (d) Failure of under reinforced prestressed concrete beam can be identified by **1**
i. very few cracks near centre of span ii. Very little deflections .iii. large number of
cracks with large deflections
- (e) For a bonded prestressed concrete beam at failure the effective reinforcement ratio **1**
according to IS:1343 is limited to a value of
i. 0.15 ii. 0.4 iii. 0.25
- (f) Horizontal prestressing of concrete beams **1**
i. has no effect on the shear strength ii. Increases the shear strength iii. Reduces the
shear strength
- (g) Transfer of prestress in pretensioned members is due to **1**
i. shear resistance ii. Bearing on end face iii. Bond between concrete and steel
- (h) Stress distribution in the anchorage zone of a post tensioned PSC beam is **1**
i. biaxial ii. Uniaxial iii. triaxial
- (i) The minimum prestressing force is a function of **1**
i. range of stress at top fibre ii. range of stress at bottom fibre iii. Range of stress at top
and bottom fibre
- (j) The clear cover to cables in a PSC post tensioned girder should not be less than **1**

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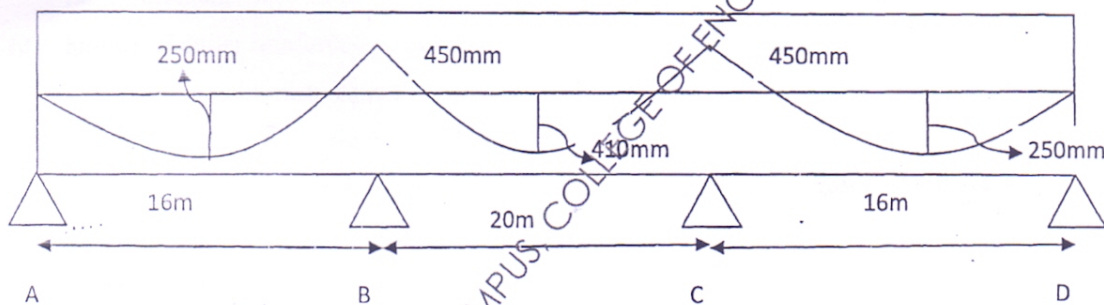
i. 50mm ii. 35mm iii. 50mm

- 1.B Write short note on advantages of prestressed concrete 5
- 1.C Write short note on advantages of continuous members in PCS 5
- 2.
- (a) A rectangular concrete beam of c/s 250mm*350mm is prestressed by means of 15 10
wires of 6mm diameter located 60mm from the bottom of the beam and 5 wires of
dia. 8mm 50mm top. Assuming prestress in steel as 1000N/mm^2 . Calculate the
stresses at the extreme fibres of the mid span section, when the beam is supporting its
own weight over a span of 5m. If a u.d.l of 5KN/m is imposed. Determine the
maximum working stress in concrete.
- (b) A prestressed concrete beam with rectangular section 120mm by 300mm deep 10
supports a u.d.l of 5KN/m including self wt. of the beam. The effective span is 6m.
The beam is concentrically prestressed by a cable carrying a force of 180KN. Locate
the position of pressure line in the beam.
- 3.
- (a) Write short note on various losses in pretensioning and post tensioning? 5
- (b) A prestressed concrete beam having size 230x400mm is prestressed with wires 15
(area = 320mm^2) located at a constant eccentricity of 55mm and carrying an initial
stress of 1200N/mm^2 the span of beam is 10m. Calculate the percentage loss of
stress in wires if-
- The beam is pretensioned
 - The beam is post tensioned
- Use the following data:
- $E_s = 210\text{KN/mm}^2$ and $E_c = 35\text{KN/mm}^2$ relaxation of steel stress = 5% of initial
stress. Shrinkage of concrete = 300×10^{-6} for pretensioning and 200×10^{-6} for post
tensioning creep coefficient = 1.6 slip at anchorage = 1mm frictional co-efficient for
wave effect = 0.0015/m
- 4.
- (a) A prestressed concrete beam having a rectangular section 100mm wide and 200mm 15
deep spans over 3m. The beam is prestressed by a straight cable containing five wires

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of 5mm diameter stressed to 1100N/mm^2 at an eccentricity of 40mm. Assume the modular ratio $\alpha = 6.2$. If the modulus of elasticity of concrete is 34KN/mm^2 and the modulus of rupture is 4N/mm^2 , calculate the maximum deflection of the beam at the following stages:

- prestress + self wt. of the beam
 - prestress + self wt.+ imposed load of 8 KN/m
 - Cracking load
 - 1.46 times the working load
- (b) Explain safe cable zone in prestressed concrete members 5
5. Determine equivalent upward load and hence locate pressure line, is it concordant cable? If not make concordant by linear transformation. The beam is symmetrically prestressed by a cable carrying 4500KN prestressing force. 20



6. 05
- Explain the stress distribution in the end block 05
 - State and explain principle of prestressing. What is difference between service and transfer stage? 10
 - Calculate the efficiency of the sections: 10
- I-section top flange: $400 \times 200\text{mm}$ bottom flange $200 \times 200\text{mm}$ web: $100 \times 600\text{mm}$.
overall depth=1000mm
- Tee section: flange $600 \times 250\text{mm}$ web $750 \times 100\text{mm}$ overall depth= 1000mm