ADAMAS UNIVERSITY PURSUE EXCELLENCE	**ADAMAS UNIVERSITY** **END-SEMESTER EXAMINATION : JANUARY 2021** (Academic Session: 2020 – 21)		
Name of the Program:	B.TECH.	**Semester:**	VII
Paper Title :	(ELECTIVE –I) PRESTRESSED CONCRETE STRUCTURE	**Paper Code:**	ECE44109
Maximum Marks :	40	**Time duration:**	3 Hours.
Total No of questions:	8	**Total No of Pages:**	02
(Any other information for the student may be mentioned here)	**IS:456, IS:1343, IS: 875 (Part-I, III), IS:10262, IS:383** are allowed to use during examination.		

Answer all the Groups

Group A

Answer all the questions of the following $5 \times 1 = 5$

1. **a)** Prestressing is economical for which type of members?

b) Mention the minimum grade of concrete required for pretensioned prestressed concrete member.

c) Why high strength steel wires are used in prestressed concrete member?

d) The maximum effective reinforcement ratio of a bonded prestressed concrete beam at failure according to IS: 1343 is limited to a value of _____.

e) What is the most suitable cable profile if there two concentrated loads acting on a simply supported beam?

GROUP –B

Answer *any three* of the following $3 \times 5 = 15$

2. Explain with neat sketches Hoyer's long line system of prestressing.

3. A pretensioned concrete beam of rectangular cross section, 150 mm wide and 300 mm deep, is prestressed by eight high tensile wires of 7 m diameter located at 100 mm from the soffit of the beam. If the wires are tensioned to a stress of 1200 MPa, calculate the percentage loss of stress due to elastic deformation assuming the modulus of elasticity of concrete and steel are 31.5 and 210 GPa respectively.

4. A rectangular concrete beam of cross section 300 mm deep, 150mm wide is simply supported over a span of 8 m and is prestressed by means of a symmetrical parabolic cable, at a distance of 75 mm from the bottom of the beam at mid-span and 125 mm from the top of the beam at the support sections. If the force in the cables is 350 kN and the modulus of elasticity of concrete is 38 GPa, calculate :

a. The deflection at the mid-span when the beam is supporting its own weight, and
b. The concentrated load which must be applied at the mid-span to restore it to the level of supports.

5. A pretensioned concret beam of rectangular cross section, 200 mm wide and 600 mm deep, supports a live load of 8 kN/m spanning over 8m. find the effective prestressing force in the parabolic cable having an eccentricity of 80 mm at the centre of span and concentric at supports for the following loading conditions:

a. If the bending effect of the prestressing force is nullified by the imposed load for the mid span section (neglecting the self-weight of the beam),
b. The resultant stress due to self-weight, live load and prestressing force is zero at the soffit of the beam at the centre of span section (Assume D_c= 24 kN/m^3).

GROUP –C

Answer *any two* of the following $2 \times 10 = 20$

6. A post tensioned concrete beam, 100 m wide and 300 mm deep is prestressed by three cables, each with a cross sectional area of 50 mm^2 and with an initial stress of 1200 MPa. All the three cables are straight and located 100 mm from the soffit of the beam. If the modular ratio is 6, calculate the loss of stress in the three cables due to elastic deformation of concrete for only the following cases:

(i) Simultaneous tensioning and anchoring of all three cables; and
(ii) Successive tensioning of three cables, one at a time

7. A prestressed concrete beam having a cross sectional area of 5x10^4 mm^2 is simply supported over a span of 10 m. it supports a UDL of 3kN/m, half of which is non-permanent. The tendon follows a trapezoidal profile with an eccentricity of 100 mm within the middle third of the span and varies linearly from the third span points to zero at the supports. The area of tendons A_p=350 mm^2 have effective prestress of 1290 MPa immediately after the transfer. Using the following data calculate

(i) The short term deflection and
(ii) The long term deflection

8. Design a pretensioned concrete pole for following data:
Total length of pole = 7.5 m,
Depth of pole below ground level = 1.5 m,
Projection of poles above the level of wires = 0.6 m,
Minimum ultimate transvers load = 4 kN, Load factor = 2.5
fck= 40 MPa; Characteristic strength of concrete at transfer = 30 MPa,
fp=1600 MPa; Loss in prestress = 20 %
Design wind pressure = 10 N/mm2 as per IS: 875-1987-Part-III
Permissible stress in concrete at transfer in compression = 0.5 fci , and in tension = 0
Design PSC pole as a class 2 structure according to IS: 1343:2012
