B. Construction Engineering 3rd Year 2nd Semester Examination 2023

PRE-CAST & PRE-STRESSED CONCRETE

Time : Three hours Full Marks : 100

(50 Marks for each Part)

Use separate answer script for each Part

PART I (50 Marks)

Answer any **Two** Questions. Assume any suitable data not provided.
Answer should be explained with **Neat Sketches.**

1. (a) What do you mean by **Pre-Stressed Concrete**? Mention its advantages and discuss different types of pre-stressing. **5**

(b) Discuss **Principle** of **Pre-stressed Concrete** from Load Balancing Concept. **8**

(c) **Design a pre-stressed concrete beam** of rectangular cross section over a simple supported span of 18 m. A super imposed load of 16 KN/m udl and a point load of 55 KN at mid span will be subjected on the beam. The **permissible stresses in concrete are 0 and 14.5 MPa** and in **pre-stressing steel is 1050 MPa.** **12**

2. A T beam is used to support live load of 35 KN/m over a simple supported span of 27.5 meters. The size of the top flange is 1000 x 300 mm. The overall depth of the pre-stressed beam is 1500 mm. Thickness of the web is 160 mm. Assume density of concrete is 25 KN/m3. Initial pre-stressing forces each of 1750 KN applied through the 80 mm diameter cable ducts, the centres of which are located at 250 mm and 450 mm above the soffit (bottom) of the beam at mid span. Calculate the stress at transfer and final stages at top and bottom fibres at mid span. Assume total loss of pre-stress of 16% at the final stage. **25**

3. a) Discuss Principle of Pre-stressed Concrete from Elastic Concept with example **10**

b) Define **Pressure Line from Lever Arm Concept** indicating significance of **Kern points and Kern distances** in pre-stressed concrete. **15**

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Subject: Precast & Prestressed Concrete

Total Time: Three hours
Full Marks: 100

PART II (50 Marks)

Use Separate answer sheet for each part.

CO1 [15]	[1]Answer any five from (a) –(e) in this block[5X3=15] a. Prestress concrete & advantages of Pre stress concrete b. Transmission length &cracking load c. Pre tensioning & post tensioning d. Degree of prestressing e. Transfer. f. Proof stress and creep coefficient.
CO2 [10]	[2] *Answer any one* from **(a), (b)***in this block:* a.A rectangular concrete beam of cross section 40cm deep &25 cm wide is prestressed by means of 18 wires of 5mm dia located 7 cm from the bottom of the beam & 3 wires of diameter of 5mm , 4 cm from the top. Assuming the prestressed in the steel as 950 N/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 8m. take UDL= 10KN/m. density of concrete= $24KN/m^3$ (b) A prestressed concrete beam of section 250X 400 mm deep is Prestressed by force of 600 KN at a constant eccentricity of 60 mm. the beam is supported a concentrated load of 70KNat the centre of a span of 3 meter. Determine the location of the pressure line at the centre. Neglect the self-weight of the beam.
CO3 [15]	3. (a)A rectangular concrete beam of cross section of 400× 200 is prestressed by means of 15 wires of 5mm dia located 6 cm from the bottom of the beam & 3 wires of diameter of 5mm , 4 cm from the top. Assuming the prestressed in the steel as 950 N/mm^2. Calculate the percentage loss of stress in steel due to elastic deformation of concrete.[10] (b) Write a short note on loss of prestress. Write the names of different kind of loss of prestress. [5]
CO4 [10]	*[4]* (a) A Prestress concrete beam of rectangular section 200 mm wide and 500 mm deep spans over 10m. the beam is prestressed by a straight cable carrying an effective force of 500 KN at an eccentricity of 60 mm. if its supports an imposed load of 8KN/m and the modulus of elasticity of concrete is $38KN/mm^2$, compute the deflection at the following stages and check whether they comply with the IS Code specification.(i)Upward deflection under (Prestress + self-weight) ,(ii)Final downward deflection under (Prestress+ Self-weight + imposed load) including the effects of creep and shrinkage. Assume the creep coefficient to be 1.80 , and loss 15%. [10].

CO1: **Explain and describe** Precast elements, Joints and connections. Composite precast elements, methods of prestressing (K1)

CO2: **Explain** Partial prestressing, composite construction. (K2)

CO3: **Classify and describe,**Losses of prestress(K2)

CO4: **Clarify and solve** Anchorage zone stresses, prestressed containers of systems.Solve problems regarding determinate and indeterminate structures (K3)

CO5: IllustrateTwo way prestressing, circular prestressing **(K3)**