B. Construction Engineering 3rd Year 2nd Semester Examination 2024

PRE-CAST & PRE-STRESSED CONCRETE

Time : Three hours (50 Marks for each Part) Full Marks : 100

(Part - I) (50 Marks)

Use **Separate Answer Script** for Each Part

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

1. (a) Discuss **Principle** of **Pre-stressed Concrete** from 'Elastic concept'. 7

   (b) A unequal I beam is used to support live load of 50 KN/m over a simple supported span of 28 meters. The size of the top flange is 800 mm x 200 mm and bottom flange is 450 mmx 300 mm. The overall depth of the pre-stressed beam is 1100 mm. Thickness of web is 150 mm. **20 Nos of 13 mm** dia tendons are initially pre-stressed with **1050 Mpa** is applied through 80 mm diameter cable duct, the centres of which is **located at 150 mm above the bottom** of the beam at mid span. **Calculate** the **stress at transfer and at final** stages at top and bottom fibres of mid span. Total loss of pre-stress of **14.5%** at the final stage. Density of concrete is 25 KN/m3 18

2. a) Define **pressure line** and **efficiency** from lever arm concept indicating significance of **Kern points and Kern distances** in pre-stressed concrete. **10**

   b) Calculate the **efficiency** of a double bridge box girder cross section as shown below. Neglect duct area for calculating section properties **15**
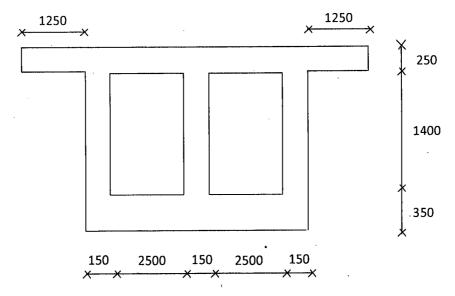

Figure: 1

3. (a) The earlier attempt of pre-stressed concrete with mild steel was failed - Why? **4**

(b) Critically compare between **Reinforced Concrete & Pre-Stressed Concrete** from conceptual consideration. **6**

(c) **Design a pre-stressed concrete** beam of rectangular cross section over a simple supported span of **15 m**. A super imposed load of **18 KN/m udl** is subjected on the beam excluding its self weight. determine the suitable dimension of the beam and calculate the area of tendon and their position. The **permissible stresses** in concrete are **0** and **14.5 MPa &** and **permissible stresses** in pre-stressing steel **is 1050 MPa.**

B. Construction Engineering 3rd year 2nd semester Examination – 2024
Subject: Precast & Prestressed Concrete

Total Time: Three hours
Full Marks: 100

PART-II(Full Marks-50)
Use Separate answer sheet for each part.

CO1
[15]
	[1]Answer any five from (a) –(e) in this block
	    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) or (b)***in this block:* a.) .A rectangular concrete beam of cross section 60cm deep & 20 cm wide is prestressed by means of 15 wires of 5mm dia located 6 cm from the bottom of the beam &4 wires of diameter of 5mm , 5 cm from the top. Assuming the prestressed in the steel as 1050 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 10m. take UDL= 15KN/m. density of concrete= $24KN/m^3$.[10] b).A prestressed concrete beam of section 250×500 mm deep is Prestressed by force of 800 KN at a constant eccentricity of 50 mm. the beam is supported a concentrated load of 75KNat the center of a span of 8 meter. Determine the location of the pressure line at the center. Neglect the self-weight of the beam.[10]
CO3 [15]	3. (a)A rectangular concrete beam of cross section of 400× 250 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 , 6 cm from the top. Assuming the prestressed in the steel as 1200 N/mm^2. Calculate the percentage loss of stress in steel due to elastic deformation of concrete.[8] (b) Write a short note on loss of prestress. Write the names of different kind of loss of prestress along with their expressions. [2+5=7]
CO4 [10]	*[4]*A Prestress concrete beam of rectangular section 300 mm wide and 700 mm deep spans over 12m. the beam is prestressed by a straight cable carrying an effective force of 300 KN at an eccentricity of 60 mm. if its supports an imposed load of 12KN/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 adopt 15% loss. Assume the creep coefficient to be 1.80 [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)**