6. What do you mean by losses of prestress ? A rectangular concrete beam 400 mm deep and 200 mm wide in prestressed by means of 15 Nos. of 5 mm diameter wires located 70 mm from the bottom of the beam and three 5 mm dia wires located 40 mm from the top of the beam. If the wires are initially tensioned to a stress of 800 N/mm^2, Calculate the % loss of stresses in steel immediately after transfer, consider only loss due to elastic deformation of concrete only. T

   Take $E_s = 2.1 \times 10^5$ MPa and $E_c = 31.5$ kN/mm^2.

   5+10=15

7. Define the different types of losses of prestress. A concrete beam of rectangular section 150 mm wide and 300 mm deep is prestressed by five wires of 7 mm ϕ located at an eccentricity of 50 mm, the initial stress in the wires being 1000 N/mm^2. Estimate the loss of stress in steel due to creep of concrete using the ultimate creep strain method and the creep coefficient method.

   Take $E_s = 210$ kN/mm^2, $E_c = 0.35$ MPa, $E_{cc} = 91 \times 10^{-6}$, $\phi = 1.6$. 8+7=15

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B. CONSTRUCTION ENGG. PART–I EXAMINATION, 2008

(2nd Semester)

PRECAST AND PRESTRESSED CONCRETE

Time : Three hours Full Marks : 100

(50 marks for each part)

Use a separate Answer-Script for each part.

PART–I

Answer any ***two*** questions.

1. How composite action is achieved between a prefabricated beam and cast-in-situ slab ?

   Differentiate between ‘Propped’ and ‘Unpropped’ condition of construction in case of construction of a composite girder.

   Calculate stress at top of slab, junction between slab and girder and soffit of girder for a composite girder having the following section properties :

   Girder $\rightarrow$ ISMB 600

   C/S Area $\rightarrow$ 156.21 cm^2

   $I_{xx} \rightarrow$ 91813.0 cm^4

   $E_s \rightarrow 2.1 \times 10^5$ MPa

   $f_y \rightarrow$ 230 MPa

   Cast-in-situ slab

   Width = 1.20 m

Thickness = 250 mm

Grade of Concrete = M25

Assume 'Unpropped' construction condition. Span of the girder is 8.0 m. 5+5+15

2. What is 'Anchorage Zone' in a prestressed concrete beam? Describe Magnel's method of calculating anchorage zone stresses. Against which kind of stress the anchorage zone is required to be protected ? At what distance away from anchorage face this stress attains maximum value ? 5+15+3+2

3. A prestressed concrete beam of size 400 mm deep and 300 mm wide is prestressed concentrically by a prestressing force of 500 kN. Size of anchor plate is 150 mm × 150 mm. Grade of concrete of the beam is M35.

Assuming that mesh reinforcement will be used, design the anchorage zone reinforcement by using Magnel's method and compare the same with the method specified in IS 1343. Values of Magnel's coefficients K_1, K_2 & K_3 for different values of x/h is given below :

x/h	K_1	K_2	K_3
0.2	2.56	1.28	2.048
0.3	–1.96	1.96	2.058
0.5	– 5.0	2.0	1.25
0.9	–0.52	0.16	0.018
1.0	0	0	0

15+10

PART–II

Answer question No. **1** and any ***two*** from the rest.

4. Define the following terms : 5×3=15

a) Pretensioning and past tensioning.

b) Advantage and disadvantage of Prestress Concrete.

c) Tendon and duet

d) Axial prestressing an Eccentric prestressing.

e) Concrete and Prestress Concrete.

A rectangular concrete beam 250 mm wide and 600 mm deep is prestressed by means of four wires of 10 mm diameter, high tensile bars located 200 mm from the soffit of the beam. If the effective stress in wires is 700 MPa what is the maximum bending moment that can be applied to the section without causing tension at the soffit of the beam. 5

5. What do you mean by pressure line or thrust line in a Prestress Concrete.

A Prestress Concrete beam with a rectangular section 150 mm wide by 300 mm deep supports a udl of 5 kN/m, which includes the self weight of the beam. The effective span of the beam is 6 m. The beam in concentrically prestressed by a Cable carrying a force of 300 kN. Locate the position of the pressure line in the beam. And draw also the pressure diagram. 5+10=15