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Code No: 128DV

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year II Semester Examinations, July - 2019
PRESTRESSED CONCRETE STRUCTURES
(Civil Engineering)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

Code of IS 1343-2012 is permitted

PART - A

(25 Marks)

1.a)	Mention different types of prestressing systems.	[2]
b)	Explain Magnel Blaton system of prestressing.	[3]
c)	How do you estimate the loss of prestress due to creep of concrete?	[2]
d)	What are the time dependent losses in prestressed concrete?	[3]
e)	What are the codal recommendations for shear reinforcement in PSC beams?	[2]
f)	Explain the different failure modes of PSC beams.	[3]
g)	Describe transmission length.	[2]
h)	Briefly explain the stress distribution in end block of post tensioned PSC members.	[3]
i)	Explain the various factors influencing the deflection of PSC members?	[2]
j)	What are short term and long term deflection?	[3]

PART - B

(50 Marks)

2. Explain with neat diagram hoyers long line method of prestressing system. [10]

OR

3. Explain briefly the difference between reinforced cement concrete and prestressed concrete. [10]

4. A pre tensioned concrete beam 200mm wide and 300mm deep and span of 6m is initially prestressed by a force of 400kN applied at a constant eccentricity of 70mm by tendons of area 400 mm^2. If Es = $2 \times 10^5 N/mm^2$. Ec = $0.333 \times 10^5 N/mm^2$, Creep co-efficient in concrete = 2, shrinkage strain in concrete = 0.0002, stress relaxation in steel = 3%. Find the percentage loss of stress in tendons. [10]

OR

5. A post tensioned rectangular beam 300mm × 600mm in section is prestressed with an initial prestress of 950 N/mm^2. There are four straight cables of each area 250 mm^2. The cable are situated at 100mm from the soffit. Determine the percentage loss of prestress due to concrete. Assume the following :
a) Shrinkage strain in concrete = 2×10^{-4}
b) Modular ratio = 6
c) Ultimate creep strain of the concrete = 4×10^{-6}
The cables are pulled one by one. [10]

6. Using Fe 415 reinforcement, Design the shear reinforcement using IS recommendations for the following data. B = 200mm: D= 300mm, Vu = 180kN: fck = 40N/mm^2. Effective cover = 50mm, compressive stress = 5 N/mm^2. [10]

OR

7. A concrete beam of rectangular section 300mm × 800mm deep is prestressed by a parabolic cable at an eccentricity of 120mm at mid span and zero at support. If the beam has a span of 12m and carries a live load of 8 kN/m. Find the effective force necessary in cable for zero shear stress at support section. For this condition, calculate the permissible stresses. [10]

8. The end block of a post tensioned beam is 150 × 300mm in section. A cable comprising of 3 members of 12-7mm dia and stressed to 1200N/mm^2 is anchored against the end block at 100 mm from the soffit of the beam. The anchorage plate is 75mm × 75mm. The cable bears on the plate through a female cone of 30mm in dia. calculate the thickness of anchorage plate and design the anchorage reinforcement. Given permissible shear stress in steel plate is 100N/mm^2. Use Fe415 steel and M30 grade concrete. Sketch the detailing of reinforcement. [10]

OR

9. A PSC beam 300mm wide and 500mm deep has two anchorages of 150mm diameter with the center at 125mm from top and bottom of the beam. The force transmitted by each cable is 800kN. Estimate the maximum tension and bursting tension. [10]

10. A rectangular beam of span 10m is 200mm wide and 350mm deep. The beam is prestressed by a parabolic cable having an eccentricity of 100mm below the central axis at mid span and 25mm above the centroidal line at support section. The beam carries an UDL of 8kN/m. Ec = 38kN/mm^2
a) Estimate the short term deflection neglecting the loss of prestress
b) Estimate the long term deflection assuming the loss of prestress as 15%. Assume the creep co-efficient as 1.8. [10]

OR

11. A prestressed concrete beam has a symmetrical I – section with overall depth 320mm. Top and bottom flange width = 160mm. The flange thickness = 70mm. The web is 50mm in thickness and the span = 6m. It is prestressed with 182kN at a constant eccentricity of 105mm. Assume a loss of 15% in prestress. Compute the deflection due to
a) Prestress + self weight
b) Prestress + self weight + Live load of 15kN/m.
Ec = 38kN/mm^2 [10]

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