Code No: 118DV

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year II Semester Examinations, April - 2018

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.
Use IS 1343 Code Books.

PART - A

25 Marks

1.a)	What is pre-tensioning and post-tensioning?	[2]
b)	What are the materials used for PSC and why?	[3]
c)	Explain the terms loss of pre-stress.	[2]
d)	Briefly explain about Slip in Anchorage.	[3]
e)	Define axial prestressing.	[2]
f)	Explain the concept of load balancing.	[3]
g)	What is anchorage zone?	[2]
h)	Briefly write about the problems in end block design?	[3]
i)	What are the major disadvantages of using composite beam?	[2]
j)	Explain the importance of controlling deflections in PSC beams?	[3]

PART-B

50Marks

2.a) What are the main factors influencing the design of high strength concrete mixes?-
b) Discuss the advantages and limitations of prestressed concrete. [5+5]

OR

3. With neat sketches explain Hoyer System and Magnel System of prestressing. [10]

4. Explain various Losses of prestress in pre-tensioned and post-tensioned members and how they are taken care in design? [10]

OR

5.a) A prestressed concrete girder is post-tensioned using a cable concentric at supports and having an eccentricity of 400mm at centre of span. The effective span of the girder is 25m. The initial force in the cable is 400kN at the jacking end A. Determine the loss of force in the cable due to fricition and wave effect and the effective force in the cable at the farther end B. Assume coefficient of fricition μ=0.30 and coefficient for wave effect k=0.0043/m.

b) A pre-tensioned prestressed concrete sleeper 300mm wide by 250mm deep is prestressed using 9 wires of 7 mm diameter. Four wires are located at top and 5 wires near the soffit. The effective cover being 40mm.The initial stress in the wire sis 1256N/mm^2.Assuming the modular ratio as 6,estimate the percentage loss of stress in the top and bottom wires due to elastic deformation of concrete. [5+5]

6.a) Explain the relation between tendon profiles and equivalent loads in prestressed concrete beam sections with sketches?

b) A rectangular concrete beam 100mm wide by 250mm deep spanning over 8m is prestressed by a straight cable carrying an effective prestressing force of 250 kN located at an eccentricity of 40mm. The beam supports a live load of 1.2kN/m (i) calculate the resultant stress distribution for the central cross section of the beam. The density of concrete is 24kN/m^3 (ii) find the magnitude of the prestressing force with an eccentricity of 40mm which can balance the stresses due to dead and live loads at the bottom fibre of the central section of the beam. [5+5]

OR

7.a) What are the different ways of improving the shear resistance of structural concrete members by prestressing techniques?

b) The support section of a prestressed concrete beam 100mm wide by 250mm deep is required to support an ultimate shear force of 60 kN. The compressive prestress at centroid is 5 N/mm^2, f_{ck} = 40 N/mm^2, effective cover to reinforcement =50mm. If f_y=415 N/mm^2, design suitable shear reinforcement in the section using IS: 1343 Code recommendations. [5+5]

8.a) What is bursting tension? Explain with neat sketches the effect of varying the ratio of depth of anchorage to the depth of end block on the distribution of bursting tension.

b) Explain in detail about the anchorage zone reinforcement with neat sketches. [5+5]

OR

9. The end block of a prestressed concrete beam in section is 150 mm wide and 400 mm deep. An effective prestressing force of 400 kN is transmitted using a 150 × 120 mm distribution plate, concentrically located at the ends. Compute the bursting force and maximum tensile stress? Design the end block. Use Fe415 steel. [10]

10. A composite bridge deck is made up of an in situ cast slab 120mm thick and symmetrical I-sections of precast pre-tensioned beams having flange width and thickness of 200 mm and 110mm respectively.
Thickness of web=75mm. Overall depth of I section =500mm.Spacings of I- beams = 750 mm centres. The modulus of elasticity of in situ slab concrete is 30kN/mm^2.Estimate the stresses developed in the composite member due to a differential shrinkage of 100×10^{-6} between the precast and cast in situ elements. [10]

OR

11.a) List the various factors influencing the deflections of prestressed concrete members.

b) Distinguish clearly between short term and long term deflections of prestressed concrete beams. [5+5]

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