Reg. No. : | | | | | | | | | | |

Question Paper Code: 92062

M.E. DEGREE EXAMINATION, OCTOBER 2014.

Elective

Structural Engineering

01PSE510 – PRESTRESSED CONCRETE STRUCTURES

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1) Differentiate “post tensioning system” & “pre tensioning system”.
2) List any four types of pre tensioning losses.
3) Compare the shear carrying capacity of RCC beam and PSC beam.
4) What do you mean by Type I classification of flexural members?
5) Define linear transformation.
6) State the condition for a cable to be concordant.
7) When pre stressing is advantageous in columns?
8) Give some advantages of PSC piles over RCC piles.
9) What is meant by partial prestressing?
10) Write down the concept involved in the design of composite members.

PART - B (5 x 14 = 70 Marks)

11. (a) (i) What are the various methods of prestressing? Describe with suitable sketches some of the methods. (8)

(ii) Describe briefly the various losses of prestress in pretensioned members. (6)

Or

(b) A prestressed concrete beam having a cross-sectional area (A) of $5x10^4$ mm^2 is simply supported over a span of 10 m .It supports a uniformly distributed imposed load of 3kN/m, half of which is non-permanent .The tendon follows a trapezoidal profile with an eccentricity of 100 m within the middle –third of the span and varies linearly from the third-span points of zero at the supports. The area of tendon s A_p=350 mm^2 have effective prestress of 1290 N/mm^2 immediately after transfer .Use the following data, calculate 1.) The short-term deflections and 2.) The long-term deflections.

Assume $I_g=4.5x10^8$ mm^4 Density of concrete =23.6kN/m^3

E_c=34 kN/mm^2 Creep coefficient=2

A=$5x10^4$ mm^2 Concrete shrinkage, E_{cs} = 450 x 10^{-6}

E_s=200KN/mm^2 Relaxation of steel stress =10% (14)

12. (a). The end block of a post-tensioned prestressed member is 550 mm wide and 550 mm deep. Four cables, each made up of 7 wires of 12 mm diameter strands and carrying a force of 1000 kN, are anchored by plate anchorages, 150 mm by 150 mm, located with their centers at 125 mm from the edges of the end block. The cable duct is of 50 mm diameter. The 28-days cube strength of concrete f_{cu} is 45 N/mm^2. The cube strength of concrete at transfer f_{ci} is 25 N/mm^2. Permissible bearing stresses behind anchorages should conform with IS: 1343. The characteristic yield stresss in mild steel anchorage reinforcement is 260 N/mm^2. Design suitable anchorages for the end block. (14)

Or

(b) Explain the different types of flexural failure. (14)

13. (a) What are the methods to achieve continuity in continuous beams? Describe with sketches. (14)

Or

(b) A continuous beam (AB=BC=20m) with an overall depth of 1m is prestressed by a continuous cable carrying a force of 300kN. The cable profile is parabolic between the supports, with zero eccentricity at ends A and C. The cable has an eccentricity of 100 mm towards the soffit at mid span sections and 200 mm towards the top fiber at the mid support section. Calculate the reactions developed at the supports due to prestress and show the cable is concordant. (14)

14. (a) Discuss the design procedure of the compression member subjected to axial load and bending moment. (14)

Or

(b) Write the design procedure for the cylindrical water tank. (14)

15. (a) With neat sketches explain the types of composite construction and state the advantages of such construction. (14)

Or

(b) Discuss the difference in load deflection behavior of under prestressed, partially prestressed and over prestreesed cases. Why partial prestressing is preferred in design? (14)

PART - C (1 x 10 = 10 Marks)

16. (a) Write down the steps involved in the design of Flexural member? (10)

or

(b) Breifly explain the application in the design of prestressed pipes? (10)

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