[Total No. of Questions - 9] [Total No. of Printed Pages - 4] (2125)

15319

B. Tech 7th Semester Examination

Pre-stressed Concrete (NS)

CE-411(a)

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, select one question from each sections A, B, C and D. Section E (Question-9) is compulsory. Use of non-programmable calculator is allowed.

SECTION - A

1. (a) Compare the various types of pre-stressing systems and their relative advantages and limitations. (10)

   (b) Write a note on the properties of modern materials used for pre-stressed concrete. Is high strength concrete and HYSD grade steel useful for PCC? Justify. (10)

2. (a) Write a note on the limit state design philosophy of pre-stressed concrete structures. Also describe the various limits in detail. (10)

   (b) What are the limitations of pre-stressed concrete structures? Also describe the Hover, Magnel, Freyssinet and Gifford-Udall system. (10)

[P.T.O.]

SECTION - B

3. A post tensioned cable of a beam 11m long is initially tensioned to a stress of 1000N/mm^2 at one end. If the tendons are curved so that the slope is 1 in 24 at each end, with an area of 600 mm^2, calculate the loss of pre-stress due to friction for the following data:- Co-efficient of friction between duct and cable=0.55, friction co-efficient for 'wave' effect=0.0015/m. During anchoring, if there is a slip of 3.5 mm at the jacking end; calculate the final force in the cable and the percentage loss of pre-stress due to friction and slip. Take, E_s = 210kN/mm^2. (20)

4. A pre-stressed concrete beam of rectangular section 375mm wide and 750mm deep has a span of 12.50 m. The effective pre-stressing force is 1520 kN at an eccentricity of 150mm. The dead load of the beam is 9 kN/m and the beam has to carry a live load of 14 kN/m. Determine the extreme stresses in concrete

   (a) At the end section.

   (b) At the end section without the action of the live load.

   (c) At the mid section with the action of the live load. (20)

SECTION - C

5. (a) A pre-tensioned I-section having a flange width of 1200mm and thickness of flange is 150 mm, width and depth of the rib is 300 mm and 1500 mm respectively. The area of high tensile steel is 4800mm^2 located at an effective depth of 1700mm. If the characteristic cube strength of concrete and steel are 40 N/mm^2 and 1600N/mm^2, calculate the flexural strength of the I-section. (12)

(b) A concrete beam of rectangular section, 250mm wide and 650mm overall depth is subjected to a torque of 22 kN-m and a uniform pre-stressing force of 150kN. Calculate the maximum principle tensile stress. (8)

6. The end block of a pre-stressed concrete beam 200mm wide and 400mm deep has two anchor plates, 200x50 mm deep at 80 mm from the top and 200mm x 80mm deep located from the bottom of the beam, transmitting forces of 250kN and 300kN respectively.

(a) Find the position and magnitude of the maximum tensile stress on a horizontal section passing through the centre of the beam using Guyon's method.

(b) Evaluate the maximum tensile stress on section passing through the larger and smaller prestressing forces using Guyon's method. (20)

SECTION - D

7. A composite T-girder of span 5m is made up of a pre-tensioned rib, 100mm wide by 200mm deep with an *in situ* cast slab, 400mm wide and 40mm thick. The rib is prestressed by a straight cable having an eccentricity of 33.33 mm and carrying an initial force of 150kN. The loss of prestress may be assumed as 16 percent. Check the composite T-beam for the limit state of deflection if it supports an imposed load of 3.2 kN/m for, (a) unpropped construction & (b) propped construction.

Assume a modulus of elasticity of 35kN/mm^2 for both precast and cast *in situ* elements

Self weight of precast beam=0.48 N/mm.

Self weight of *in situ* cast slab=0.384 N/mm.

Imposed load on composite section = 3.2 N/mm.

Moment of Inertia (I) for precast section=667x10^5 mm^4.

Moment of Inertia (I) for composite section=1948x10^5 mm^4.

(20)

[P.T.O.]

8. A pre-stressed concrete beam of rectangular section, 120mm wide and 300mm deep spans over 7m. The beam is pre-stressed by a straight cable carrying an effective force of 190kN at an eccentricity of 50mm. If it supports an imposed load of 4kN/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 provisions:

(a) upward deflection under (pre-stress +self weight).

(b) final downward deflection under upward deflection under (pre-stress +self weight +imposed load) including the effect of creep and shrinkage assuming the creep co-efficient as 1.80. (20)

SECTION - E

9. (a) Differentiate between pre-tensioning and post-tensioning.

(b) List any four type of post tensioning losses.

(c) List any two advantage in partial pre-stressing.

(d) Enumerate load balancing concept.

(e) Write any two assumptions on the compatibility of strains.

(f) How do you compute the shrinkage and resultant stresses in composite member?

(g) What are the force considered in the calculation of deflection of pre-stressed concrete beams?

(h) What are the roles played by shear connectors in composite construction?

(i) What are the factors on which shrinkage in concrete depends?

(j) Define kern distance. (2x10=20)