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Question Paper Code : X20316

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
AND APRIL/MAY 2021
Seventh Semester
Civil Engineering
CE 6702 – PRESTRESSED CONCRETE STRUCTURES
(Common to PTCE 6702 – Prestressed Concrete Structures for B.E. (Part – Time)
– Sixth Semester – Civil Engineering – Regulations – 2014)
(Regulations 2013)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. What are the principle of post tensioning ?
2. Mention the necessity of High strength concrete in Prestressing works.
3. Differentiate between pre-tensioning and post-tensioning.
4. Mention the three way of improving the shear resistance of structural concrete members by prestressing techniques.
5. Name any four factors that influence the deflection in prestressed concrete members.
6. Sketch the distribution in end block with
   i) Single anchor plate
   ii) Double anchor plate.
7. How to achieve compositeness between precast and cast in situ part ?
8. Distinguish between propped and unpropped construction methods.
9. List the different types of prestressing adopted for the walls of a water tank.
10. Define Circular prestressing.

PART – B **(5×13=65 Marks)**

11. a) i) Describe briefly Gifford-Udol anchorage system with sketches. **(4)**

ii) A prestressed concrete beam 400 mm × 600 mm in section has the span of 6 m and is subjected to an UDL of 20kN/m. The prestressing tendons are located at an eccentricity of 120 mm below the centroidal axis and provide an initial prestressing force of 150 kN. Determine the extreme fibre stresses in concrete at the initial and as well as final stages developed at the mid span. Assume a loss of 20% in prestress. **(9)**

(OR)

b) i) What are the losses common for pre tensioned and post tensioned members ? **(4)**

ii) A prestressed concrete beam 200 mm wide and 300 mm deep, is prestressed with wires (area = 300 mm^2) located at a constant eccentricity of 60 mm and carrying an initial stress of 1200 N/mm^2. The span of the beam is 10m. Calculate the percentage loss of stress in wires if the beam is pretensioned. E_s = 210 kN/mm^2 ; E_c= 35 kN/mm^2. Relaxation of steel stress = 5% of the initial stress ; shrinkage of concrete = 300×10^{-6}. Creep coefficient = 1.6. **(9)**

12. a) A post tensioned prestressed beam of rectangular section 300 mm wide is to be designed for an imposed load of 14 kN/m over a span of 10 m. The stress in concrete must not exceed 17 N/mm^2 in compression and 1.4 N/mm^2 in tension at any time. The loss of prestress may be assumed as 18%. Calculate

i) The minimum possible depth of the beam ; **(4)**

ii) The minimum prestressing force required for the given section ; and **(4)**

iii) The minimum eccentricity for the above prestressing force. **(5)**

(OR)

b) The support section of a prestressed concrete beam 100 wide and 250 mm deep is required to support an ultimate shear force of 60 kN. The compressive prestress at the centroidal axis is 5 N/mm^2. The characteristic cube strength of concrete is 40 N/mm^2. The cover to the tension reinforcement is 50 mm. If the characteristic tensile strength of steel in stirrups is 250 N/mm^2, design suitable shear reinforcements at the section using I.S. code recommendations. **(13)**

13. a) Design a prestressed concrete post tensioned beam to carry a load of 20 kN/m for a span 15 m. Adopt Magnel's graphical method.

(OR)

b) Determine the short term deflection of a simply supported prestressed concrete beam of section 300 mm × 550 mm (effective)

Span of the beam = 10 m

Prestressing force = 800 kN

Live load on the beam = 20 kN/m

Profile of the cable : curved profile with 100 mm eccentricity below CGC at mid span and 30 mm eccentricity above CGC at supports.

14. a) A composite T beam made up of pre tensioned rib 300 wide and 1000 mm deep and a cast in situ slab of 200 mm thickness and 150 mm wide. The modulus of elasticity of cast in situ slab is 28 N/mm^2. The differential shrinkage and creep is 0.0001. Determine the stresses caused by this on the precast and cast in situ concrete.

(OR)

b) Explain the method of achieving continuity in continuous beam.

15. a) A non-cylinder PSC pipe of internal diameter 1000 mm and thickness of cone shell 75 mm is required to convey water at a working pressure of 1.5 N/mm^2. The length of each pipe is 6m. The toss ratio is 0.8

   i) Design the circumferential wire winding using 5 mm dia wires stretched 1000/mm^2, **(6)**

   ii) Design the longitudinal pre stressing using 7 mm dia wires tensioned to 1000/mm^2. The max permissible tensile stress under the critical transient loading not greater than 0.8 where f_{ci} = 40 N/mm^2. **(7)**

(OR)

b) A PSC circular cylindrical tank is required to store 24,500 million litres of water. The permissible compressive stress in concrete at transfer should not exceed 13 N/mm^2 & min compressive stress under working pressure should not be less than 1 N/mm^2. The loss ratio is 0.75. HYSD wires of 7 mm dia with an initial stress of 1000 N/mm^2 are available for winding round the tank. Freyssinet cables of 12 wires of 8 mm dia which are stressed to 1200 N/mm^2 are available for vertical pre stressing. The cube strength of concrete is 40 N/mm^2. Design the tank walls.

PART – C **(1×15=15 Marks)**

16. a) A two span continuous beam ABC (AB = BC =10 m) is of rectangular section, 200 mm wide and 500 mm deep. The beam is prestressed by a parabolic cable concentric at end supports and having eccentricity of 100 mm towards the soffit of the beam at centre of spans and 200 mm towards the top of beam at mid support.The effective force in the cable is 500 kN. Show that the cable is concordant and locate the pressure line in the beam when, in addition to its self weight, it supports an imposed load of 5.6 kN/m. **(15)**

(OR)

b) Recall the design procedure for prestressed circular warer tank. **(15)**