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

Question Paper Code: 37103

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Seventh Semester

Civil Engineering

01UCE703 - PRESTRESSED CONCRETE STRUCTURES

(Regulation 2013)

Duration: One hour Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. Prestressing is economical for members of

   (a) Long span (b) Medium span (c) Short span (d) All the above

2. Pre-stressed concrete members usually contain what type of reinforcement?

   (a) Concentric (b) Eccentric (c) Parabolic (d) None of the above

3. Ultimate moment capacity of pre-stressed concrete beam depends on

   (a) amount of tensioning (c) Eccentricity of cables

   (b) Loss in prestress (d) All of the above

4. The moment of resistance of a rectangular section depends upon

   (a) Ultimate strain in concrete (b) Area of high-tensile tendons

   (c) Tensile stress in concrete (d) Shear strain in concrete

5. In post-tensioned system, end block is the region between end of beam and the section where

   (a) no lateral stresses exist (c) shear stress are maximum

   (b) only shear stress exist (d) only longitudinal stresses exist

6. Deflection of prestressed concrete beam is excessive in the

(a) Precracking stage (b) Elastic stage

(c) Post-cracking stage (d) None of the above

7. Theorem of three moments is used for analysis of

(a) Indeterminate prestressed structures (c) both type of structures

(b) Determinate prestressed structures (d) All types of structures

8. Composite construction using PSC and cast in situ concrete is adopted in

(a) Water tanks (b) Pipes (c) Bridges (d) Tunnels

9. Prestressed concrete is more desirable in case of

(a) cylindrical pipe subjected to internal fluid pressure

(b) cylindrical pipe subjected to external fluid

(c) cylindrical pipe subjected to equal internal and external fluid pressures

(d) cylindrical pipe subject to end pressures

10. A partially prestressed member is one in which

(a) tensile stresses and cracking are permitted under service loads

(b) no tensile stresses are permitted under service loads

(c) mild steel is used in addition to prestressing steel

(d) tensile stresses are permitted but not cracking at service loads

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. An unsymmetrical I-section beam is used to support an imposed load of 2 *kN/m* over a span of 8 *m*. The sectional details are top flange, 300 *mm* wide and 60 *mm* thick; bottom flange 100 *mm* wide and 60 *mm* thick; thickness of web = 80 *mm*; overall depth of beam = 400 *mm*. At the centre of span, the effective prestressing force of 100 *kN* is located at 50 *mm* from the soffit of beam. Estimate the stresses at the centre of span section of the beam for the following load conditions (a) Prestress + self-weight (b) Prestress + self-weight + live load. (8)

12. A prestressed concrete beam of (span=10 m) of rectangular cross section, 120 mm wide and 200 mm deep, is axially prestressed by a cable carrying an effective force of 200 N. The beam supports a total udl of 5 kN/m which includes the self weight of the member. Compare the magnitude of the principal tension developed in the beam with and without the axial prestress. (8)

13. The end block of a post tensioned prestressed concrete beam, 300 mm wide and 300 mm deep, is subjected to a concentric anchorage force of 832.8 kN by a Freyssinet anchorage of area 11720 mm^2. Design and detail the anchorage reinforcement for the end block. (8)

14. The cross section of a composite beam is of T section having a pretensioned rib, 80 mm wide and 240 mm deep, and an in situ cast slab 350 mm wide and 80 mm thick. The pretensioned beam is reinforced with eight wires of 5 mm dia with an ultimate tensile strength of 1600 N/mm^2, located 60 mm from the soffit of the beam. The compressive strength of concrete in the in situ cast and precaste elements is 20 mm and 40 N/mm^2 respectively. If adequate reinforcements are provided to prevent shear failure at the interface, estimate the flexural strength of the composite section. (8)

15. Design a non-cylindrical prestressed concrete pipe of 600 *mm* internal diameter to withstand a working hydrostatic pressure of 1.05 N/mm^2 using a 2.5 *mm* high tensile wire stressed to 1000 N/mm^2 at transfer. Permissible maximum and minimum stresses in concrete at transfer and service loads are 14 and 0.7 N/mm^2. The loss ratio is 0.8. Calculate the test pressure required to produce a tensile stress of 0.7 N/mm^2 in concrete when applied immediately after tensioning and also the winding stress in steel if $E_s = 210\ kN/mm^2$ and $E_c = 35\ kN/mm^2$. (8)