A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 59123

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2021

Elective

Civil Engineering

15UCE923- PRESTRESSED CONCRETE STRUCTURES

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The deflection of a pretensioned beam is influenced by CO1- R

   (a) Tendon profile (b) Anchorage slip (c) Self weight (d) Imposed load

2. Prestressing is possible by using CO1- R

   (a) Mild steel (b) High-strength deformed bars

   (c) High-tensile steel (d) None of the above

3. In partially prestressed members to which extent tensile stresses are permissible _____ CO2- R

   (a) Unlimited (b) Limited (c) Constant (d) Zero

4. The moment of resistance of a rectangular section depends upon CO2- R

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

   (c) Tension stress in concrete (d) None of the above

5. Prestressed concrete tanks are generally cylindrical with diameters upto CO3- R

   (a) 200 m (b) 100 m (c) 300 m (d) 400 m

6. The classification of concrete pipes may be done depending upon the method of CO3- R

   (a) Curing (b) Placement (c) Manufacturing (d) Tension

7. The most common type of composite construction is _____ CO4- R

   (a) I beams (b) T beams (c) L beams (d) V beams

8. Composite construction is economical since the ratio of size of precast unit to that of the whole composite member is CO4- R

(a) Increased (b) Reduced (c) Constant (d) None of the above

9. The prestressed concrete bridge decks generally comprise _____ CO5- R

(a) Precast pretensioned (b) Precast postensioned

(c) Partially pretensioned (d) Partially postensioned

10. For bridge decks of short span ranging from 15 to 25 m it is economical to use CO5- R

(a) Reinforced concrete tee beam and slab (b) Steel girder and cast in situ slab

(c) Prestressed concrete cored slab (d) None of the above

PART – B (5 x 2= 10 Marks)

11. List the advantages of prestressed concrete structures over reinforced concrete structures. CO1- R

12. Mention the types of losses in prestressed concrete structures. CO2- R

13. Define circular prestressing. CO3- R

14. Distinguish between propped and unpropped construction methods. CO4- R

15. Draw a typical cross section of pretensioned prestressed concrete bridge decks. CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) A pretensioned beam 200 mm wide and 300 mm deep is prestressed by 10 wires of 7 mm diameter initially stressed to 1200 N/mm^2 with their centroids located 100 mm from the soffit. Find the maximum stress in concrete immediately after transfer allowing only for elastic shortening. If the concrete undergoes further shortening due to creep and shrinkage while there is a relaxation of 5% of steel stress, estimate the final % loss of stress in wires using the following data: E_s = 210 KN/mm^2. $E_c = 5700\sqrt{f_{ck}}$; f_{ck} = 42 N/mm^2; creep coefficient = 1.6; total residual shrinkage strain = 3 x 10^{-4}. CO1- App (16)

Or

(b) A rectangular concrete beam 150mm wide and 300mm deep has a span of 6m with 87mm radius of gyration. The beam is prestressed by 8 wires of 8mm diameter by 400kN force. The tendon eccentricity at midspan is 75mm and zero at the supports. The beam supports an udl of 5kN/m over the entire span. Determine the magnitude of central deflection for the following cases, ignoring all losses in prestress. CO1- App (16)

(i) self weight + prestress

(ii) self weight + prestress + imposed load

17. (a) A pretensioned prestressed concrete beam having a rectangular section 150 mm wide and 350 mm deep has an effective cover of 50 mm. If f_{ck} = 40 N/mm^2, f_p = 1600 N/mm^2 and the area of prestressed steel A_p = 461 mm^2, Calculate the ultimate flexural strength of section using IS 1343 provisions. CO2- App (16)

Or

(b) The end block of a post tensioned concrete beam 300mm wide and 500mm deep supports a prestressing force of 210 kN at an eccentricity which coincides with the bottom kern of the section. The anchor plate is 60mm wide and 60mm deep. M45 concrete is used. Transfer is at 28 days. Design and detail the end block using IS 1343 codal provision. CO2- App (16)

18. (a) A cylindrical PSC water tank of internal diameter 30m is required to store water over a depth of 7.5m. The permissible compressive stress in concrete at transfer is 13 N/mm^2. The minimum compressive stress under working pressure is 1 N/mm^2. The loss ratio is 0.75. Wires of 5mm diameter with an initial stress of 1000 N/mm^2 are available for circumferential winding and Freyssinet cables made up of 12 wires of 8mm diameter stressed to 1200 N/mm^2 are to be used for vertical prestressing. Design the tank walls assuming the base as fixed. The cube strength of concrete is 40 N/mm^2. CO3- App (16)

Or

(b) Write down the step by step design procedure for cylindrical CO3- App (16)

prestressed concrete water tank.

19.	(a)	Explain the advantage of using precast prestressed element along with insitu concrete.	CO4- Ana	(16)
		Or		
	(b)	Explain different types of composite construction with sketches.	CO4- Ana	(16)
20.	(a)	With figures explain the construction sequence and tendons profiles of segmental prestressed concrete balanced cantilever bridges.	CO5- U	(16)
		Or		
	(b)	Briefly explain the various steps involved in the design –post tensioned prestressed concrete bridge decks.	CO5- U	(16)