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 **Reg. No. :**

**Question Paper Code: 47013**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Seventh Semester

Civil Engineering

14UCE703 - PRESTRESSED CONCRETE STRUCTURES

 (Regulation 2014)

(IS1343:2012 and IS3370 Part III & IV is permitted)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Prestressing is economical for members of

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

2. Prestressing wires in electric poles are

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

3. Prestressed concrete beam fails suddenly without warning due to

 (a) Failure of concrete in compression zone

 (b) Failure of concrete in tension zone

 (c) Failure of steel in tension

 (d) Failure of concrete in shearzone

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. Maximum permissible final deflection of a beam should not exceed

 (a) Span/350 (b) Span/250 (c) Span/480 (d) Span/500

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. In composite construction, prestressed construction, prestressed elements are used

 advantageously in the

 (a) Compression zone (b) shear zone

 (c) Tension zone (d) Neutral axis zone

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

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

9. Circular prestressing of concrete tanks induces

 (a) Hoop tension (b) Hoop compression

 (c) Flexural compression (d) Flexural tension

10. Failure of non-cylinder pipes is due to

 (a)Bursting (b) compression of concrete

 (c) Excessive cracking of concrete (d) Flexural cracking of concrete

PART - B (5 x 2 = 10 Marks)

11. List the grade of concrete and steel used for prestressed concrete..

12. Illustrate the different types of flexural failure.

13. Illustrate the different types of flexural failure.

14. Enumerate the merits of composite construction.

15. State the applications of prestressed concrete poles.

PART - C (5 x 16 = 80 Marks)

16. (a) A rectangular prestressed concrete beam 150 mm wide and 300 mm deep is used

 over an effective span of 10m. The cable with zero eccentricity at the supports and

 linearly varying to 50 mm at the centre, carries an effective prestressing force of

 500 kN. Find the magnitude of the concentrated load Q located at the centre of the

 span for the following conditions at the centre-of-span section:

 (i) If the load counteracts the bending effect of the prestressing force (neglecting self

 weight of beam), and

 (ii)If the pressure line passes through the upper kern of the section under the action

 of the external load, self-weight and prestress. (16)

Or

 (b) A prestressed concrete pile, 250 mm square contains 60 pretensioned wires, each of

 2 mm diameter, uniformly distributed over the section. The wires are initially

 tensioned on the prestressing bed with a 300 kN. Calculate the final stress in

 concrete and the percentage loss of stress after all losses, given the following data:

 Es = 210 kN/mm2, Ec = 32 kN/mm2, Shortening due to creep = 30X10-6 per unit

 length,Total Shrinkage = 200 X 10-6 per unit length, Relaxation of steel stress = 5 %

 of initial stress. (16)

17. (a) (i) A pretensioned T-section has a flange which is 300 mm wide and 200 mm thick.

 The rib is 150 mm wide by 350 mm deep. The effective depth of cross section is

 500 mm. Given Ap = 200 mm2, fck = 50 N/mm2 and fp = 1600 N/mm2, estimate

 the ultimate moment capacity of the T-section using the IS: 1343 code regulations.

 (12)

 (ii) Explain the steps to be followed in strain compatibility method. (4) Or

 (b) A pretensioned, T-section has a flange 1200 mm wide and 150 mm thick. The width

 and depth of rib are 300 mm and 1500 mm respectively. The high tensile steel has

 an area of 4700 mm2 and is located at an effective depth of 1600 mm. If the

 characteristic cube strength of the concrete and tensile strength of steel are 40 and

 1600 N/mm2 respectively, calculate the flexural strength of the T-section. (16)

18. (a) Elaborate the different deflection cases with formulas in prestressing of concrete.

 (16)

Or

 (b) The end block of a post-tensioned girder is 200 mm wide by 600 mm deep. The

 girder is prestressed by a concentric cable carrying an effective force of 800 kN. The

 cable has to be anchored against the end block using an anchor plate at the centre of

 the girder. If the cube strength of concrete at transfer is 30 N/mm2 and the

 permissible shear stress in steel is 100 N/mm2, design the size and thickness of the

 steel anchor plate. . (16)

19. (a) Describe the methods of computing the ultimate flexural and shear strength of

 composite sections. (16)

Or

(b) Explain the various steps involved in the design of continuous prestressed concrete beams. (16)

20. (a) (i) Explain the applications of partial prestressing. (10)

 (ii) List out the advantages of partial prestressing. (6)

 Or

 (b) (i) Write short notes on the advantages of prestressed concrete poles. (8)

 (ii) List the various design criteria to be considered while designing poles for

 power transmission lines. (8)