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

Question Paper Code: 59123

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

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 prestressing concrete member is carried out to reduce _____ CO1- R

   (a) Compressive stresses (b) Tensile stresses (c) Bending stresses (d) Shear force

2. The loss of prestress due to elastic deformation of concrete depends on CO1- R

   (a) Modular ratio and average stress (b) Modular elasticity and shear

   (c) Prestress in concrete (d) Modulus of elasticity in steel

3. One of the criteria considered for ultimate limit state is _____ CO2- R

   (a) Bursting of midspan (b) Bursting of end block

   (c) Bursting of edge block (d) Bursting of middle block

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

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

5. In circular prestressing the tension in the wire is produced by pulling it through _____ CO3- R

   (a) Tendons (b) Anchorages (c) Bars (d) Die

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 main advantage of composite member is _____ CO4- R

(a) Ease of work (b) Decreased workability

(c) Increased depth of foundation (d) Decreased depth of foundation

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

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

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

(a) Precast pretensioned (b) Precast postensioned

(c) Partially pretensioned (d) Partially postensioned

10. The post tensioning is ideally suited for prestressing of _____ CO5- R

(a) Short span girders (b) Long span girders (c) Effective span (d) Limited span

PART – B (5 x 2= 10 Marks)

11. List the types of losses of prestress. CO1- R

12. Define anchorage zone. CO2- R

13. Define circular prestressing. CO3- R

14. Write the effect of differential shrinkage in a composite beam. CO4- R

15. Draw the cross sectional profile of a most commonly used Pre-stressed concrete beams in bridges. CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) A rectangular concrete beam of 230mm wide and 450mm deep and 4m span is prestressed by 650kN force at a constant eccentricity of 75mm. The beam supports three concentrated loads of 25kN at each quarter span points. Determine the location of the pressure line at the centre, quarter span and support sections of the beam. Neglect the moment due to self weight. 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 PSC T – section has 1800mm x 200mm flange, 450mm x 1500mm rib and 100 numbers of 8mm HTS wires located at 1600mm from the top of flange. Calculate the flexural strength of beam using M40 and Fe1600. 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) Design a non cylindrical PSC pipe of 600mm internal diameter to withstand a working hydrostatic pressure of 1.5 N/mm^2 using 2.5mm HYSD stressed to 1000 N/mm^2 at transfer. Permissible maximum and minimum stresses in concrete at transfer and service load are 14 N/mm^2 and 0.7 N/mm^2. The loss ratio is 0.8. $E_s = 210k\ N/mm^2$ and $E_c = 35k\ N/mm^2$. CO3- App (16)

19. (a) Explain the advantage of using precast prestressed element along with insitu concrete. CO4- Ana (16)

Or

(b) A precast pretensioned beam of rectangular section has a breadth of 100mm and depth 200mm and effective span of 5m. The beam is prestressed with C.G of steel coinciding with the bottom kern. The force at transfer in the tendons is 150kN. Loss of prestress is 15%. The beam is incorporated in a composite "T" beam by casting a top flange of breadth 400mm and thickness 40mm. The composite beam supports a live load of 7 kN/m^2. Calculate the resultant stresses developed in the precast and insitu concrete taking the pretensioned beam is unpropped during casting of the slab. M40 and M20 concrete are used for pretensioned and in-situ concrete respectively. 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) Write the design procedure of post tensioned Prestressed Concrete - T beam slab bridge deck. CO5- U (16)