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

Question Paper Code: 52623

M.E. DEGREE EXAMINATION, MAY 2017

Second Semester

Structural Engineering

15PSE203 - DESIGN OF PRESTRESSED CONCRETE STRUCTURES

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

(Relevant IS codes are permitted)

PART A - (5 x 1 = 5 Marks)

1. The ratio of total creep strain to elastic strain is called

   (a) proof Stress (b) creep coefficient (c) kern (d) loss ratio

2. The values of creep coefficient is _____ for 7 days.

   (a) 1.1 (b) 2.2 (c) 3.3 (d) 4.4

3. Tendon profile which do not induce secondary moments is called as

   (a) concordant profile (b) secondary profile
   (c) pressure line (d) cable profile

4. Prestressed concrete tanks are generally cylindrical with diameters upto

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

5. The most common type of composite construction is

   (a) T section (b) box section
   (c) circular section (d) none of these

PART B - (5 x 3 = 15 Marks)

6. What is concordant prestressing?

7. Define degree of prestressing.

8. What are the advantages of continuous beam?

9. Classify the tanks based on the joint.

10. Differentiate between propped and unpropped composite construction.

PART C - (5 x 16 = 80 Marks)

11. (a) A rectangular concrete beam 100mm wide and 250mm deep spanning over 8m is prestressed by a straight cable carrying a effective prestressing force of 250kN located at an eccentricity of 40mm. The beam supports a live load of 1.2 kN/m (i) Calculate the resultant stress distribution for the centre of the span cross section of the beam assuming the density of concrete as 24kN/m^2 (ii) Find the magnitude of prestressing force with an eccentricity of 40mm which can balance the stresses due to dead load & live load at the soffit of the centre span section. (16)

Or

(b) A pre-stressed concrete beam, 250 mm wide and 350 mm deep, is used over a effective span of 6m to support an imposed load of 4 KN/m. the density of concrete is 24 KN/m^3. Find the magnitude of the eccentric pre-stressing force located at 100 mm from the bottom of the beam which would nullify the bottom fibre stress due to loading. (16)

12. (a) Explain various types of flexural failures in prestressed concrete structures. (16)

Or

(b) The end block of a post tensioned prestressed concrete beam rectangular in section 100 mm wide and 200 mm deep. The prestressing force of 100 KN is transmitted to concrete by a distribution plate, 100 mm wide and 50 mm deep, concentrically located at the ends. Calculate the position and magnitude of the maximum tensile stresses on the horizontal, section through the centre and edge of the anchor plate. Compute the bursting tension on these plates. (16)

13. (a) A continuous beam ABC (AB=BC=10m) is prestressed by a parabolic cable carrying an effective force of 200kN.The beam supports dead load and live load of 0.24kN/m and 2.36 kN/m respectively. Calculate the resultant moments developed in the beam and locate the pressure line. (16)

Or

(b) Briefly explain the necessity of using composite section in PSC structures. Also discuss about the shear in composite beams. What are the provisions usually made to counteract the effects. (16)

14. (a) Briefly explain the various steps involved in the design of prestressed concrete pipes both cylindrical and non cylindrical. (16)

Or

(b) List and explain the types of prestressed concrete pipes with neat sketches. (16)

15. (a) A composite T girder of span 5 m is made up of a pretensioned rib 100mm wide by 40 mm thick. The rib is prestressed by a straight cable having an eccentricity of 33.33 mm and carrying an initial force of 150 KN.The loss of prestress may be assumed to as 15%. Check the composite T beam for the limit state of deflection, if it supports an imposed load of 3.2 KN/m for (a) unpropped construction (b) propped construction. Assume E=35 KN/mm^2 for both precast and insitu cast elements. (16)

Or

(b) Design a composite PSC beam for the following data: Span=12m; live load = 5kN/m^2; σ_{ci} = 14 N/mm^2; η =85%; Depth of the slab =150mm; f_{pe}= 950 N/mm^2; m=0.6; spacing of beam= 3.5m; Breadth of the web = 150mm; b_f= 1500mm. Assume post tension. (16)