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**C Reg. No. :**

**Question Paper Code: 52P63**

M.E. DEGREE EXAMINATION, NOV 2017

Second Semester

Structural Engineering

15PSE203 - DESIGN OF PRESTRESSED CONCRETE STRUCTURES

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 1= 5 Marks)

|  |  |  |  |  |  |  |  |  |  |  |
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| 1. | What is Young’s modulus of M35 grade concrete | | | | | | CO1- R | | | |
|  | (a) 33521N/mm2 | | | | (b) 33621N/mm2 | | | | | |
|  | (c) 33721N/mm2 | | | | (d) 33821N/mm2 | | | | |
| 2. | The values of creep coefficient is \_\_\_\_\_\_\_\_\_\_\_\_\_\_for 1 year | | | | | | CO2 -R | | | |
|  | (a) 1.1 | | (b) | | | (c) | (d) 4.4 | | | |
| 3. | Reduction in the size of the structures results in ------ structures. | | | | | | CO3- R | | | |
|  | (a) Heavier | | (b) Lighter | | | (c) Both (a) and (b) | (d) None of these | | | |
| 4. | The maximum value for the longitudinal bending stresses during winding for a prestressed concrete poles is | | | | | | CO4 -R | | | |
|  | (a) 0.344fr | | (b) 0.355 fr | | | (c) 0.366 fr | (d) 0.377 fr | | | |
| 5. | The prestressed units are used in the \_\_\_\_\_\_\_\_ zone of the composite prestressed concrete construction | | | | | | CO5- R | | | |
|  | (a) Tension | | | (b) compression | | (c) both (a) and (b) | (d) either (a) or (b) | | | |
|  | PART – B (5 x 3= 15Marks) | | | | | | | | | |
| 6. | Define Prestressed concrete.CO1-U | | | | | | | | | |
| 7. | What is effective reinforcement ratio?CO2-R | | | | | | | | | |
| 8. | Evaluate the effects of prestressing the indeterminate structures.CO3-E | | | | | | | | | |
| 9. | Define circular prestressing.CO4-U | | | | | | | | | |
| 10. | Draw any four types of composite prestressed concrete sections. CO5-U | | | | | | | | | |
|  | PART – C (5 x 16= 80Marks) | | | | | | | | | |
| 11. | (a) | A rectangular concrete beam of cross section 30 cm deep and 20 cm wide is prestressed by means of 15 wires of 5 mm diameter located 6.5 cm from the bottom of the beam and 3 wires of 5 mm diameter located at 2.5 cm from the top. Assuming the prestress in the steel as 840 N/mm2, calculate the stresses at the extreme fibres of the midspan section when the beam is supporting its own weight over a span of 6 m. If a udl of 6 KN/m is imposed, evaluate the maximum working stress in concrete. Take density of concrete as 24 KN/m3. | | | | | | CO1- App | (16) | |
|  |  | Or | | | | | |  |  | |
|  | (b) | A prestressed concrete beam of section 150 mm wide and 300mm deep is used over an effective span of 6 m support a udl of 5 kN/m including selfweight. The beam is concentrically prestressed by a straight cable carrying a force of 200 KN.Determine the location of the thrust line in the beam and plot its position. | | | | | | CO1- App | (16) | |
|  |  |  | | | | | |  |  | |
| 12. | (a) | The end blocks of a post-tensioned prestress concrete beam, 300mm wide and 300mm deep, is subjected to a concentric anchorage force of 832800N by a Freyssinet anchorage of area 11720m2.Design and detail the anchorage reinforcement for end block. | | | | | | CO2- App | (16) | |
|  |  | Or | | | | | |  |  | |
|  | (b) | Write the recommendations for Design for shear based on I.S. 1343 Code. | | | | | | CO2- U | (16) | |
|  |  |  | | | | | |  |  | |
| 13. | (a) | A prestressed beam with rectangular cross section with a width of 120mm and depth of 300mm is continuous over two spans AB=BC= 8m. The cable with zero eccentricity at the ends and an eccentricity of 50mm towards the top fibres of the beam over the central support, carries an effective force of 500kN. | | | | | | CO3-App | (16) | |
|  |  | Or | | | | | |  |  | |
|  | (b) | Explain in detail about the concordant cable profile. | | | | | | CO3-U | (16) | |
|  |  |  | | | | | |  |  | |
| 14. | (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/mm2 and the minimum compressive stress under working pressure is 1 N/mm2. The loss ratio is 0.75. Wires of 5mm diameter with an initial stress of  1000 N/mm2 are available for circumferential winding and Freyssinet cables made up of 12 wires of 8mm diameter stressed to 1200 N/mm2 are to be used for vertical prestressing. Design the tank walls assuming the base as fixed. The cube strength of concrete is 40 N/mm2 | | | | | | CO4 - App | (16) | |
|  |  | Or | | | | | |  |  | |
|  | (b) | Design the non cylindrical PSC pipe of 600mm internal diameter to withstand a working hydrostatic pressure of 1.05 N/mm3 using a 2.5mm high tensile wire stressed to 1000 N/mm2 at transfer .Permissible maximum and minimum stresses in concrete at transfer and service loads are 14 and 0.7N/mm2.The loss ratio is 0.8 .Calculate also the test pressure required to produce a tensile stress of 0.7N/mm2 in concrete when applied immediately after tensioning and also the winding stress in steel if Young’s modulus for concrete and steel are 35 kN/mm2,210kN/mm2. | | | | | | CO4 - Ana | (16) | |
| 15. | (a) | A precast pretensioned beam of rectangular section has a breadth of 100mm and depth of 200mm. The beam with an effective span of 5m is prestressed by the tendons with their centroids coinciding with the bottom kern. The initial force in the tendons is 150kN. The loss of prestress is 15%. The top flange width is 400mm with the thickness of 40mm.If the composite beam supports a live load of 7kN/m2 calculate the resultant stresses developed if the section is unpropped. M40 and M20 concrete are used for pretensioned and insitu concrete. | | | | | | CO4 - App | (16) | |
|  |  | Or | | | | | |  |  | |
|  | (b) | Design a composite slab for the bridge deck using a standard inverted T-section. The top flange is 300mm wide and 110mm thick. The bottom flange is 550mm wide and 250mm thick. The web thickness is 100mm and the overall depth of the inverted T. Section is 655mm. The bridge deck has to support a characteristic imposed load of 50 KN/m2, over an effective span of 12m. Grade 40 concrete is specified for the precast pretensioned T-with a compressive strength at transfer of 36 N/mm2. Calculate the minimum prestress necessary and check for safety under serviceability limit state. | | | | | | CO5-App | (16) | |
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