Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **16CE2003** | **Duration :** | **3hrs** |
| **Sub. Name :** | **PRESTRESSED CONCRETE STRUCTURES** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

**(IS 1343:2012 is permitted/Assume the relevant design data)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | A rectangular concrete beam of 200mm wide and 350mm deep spanning over 5m is prestressed by a straight cable carrying an effective prestressing force of 350kN located at an eccentricity of 50mm. Live load on beam 3kN/m. Analyse the resultant stress distribution at the center of the c/s of beam. | CO1 | 15 |
| b. | List the devices can be used for post tensioning system. | CO2 | 5 |
| **(OR)** | | | | |
| 2. |  | Explain the different type of losses that occurs in pre tension and post tension members as per IS 1343:2012. | CO2 | 20 |
|  |  |  |  |  |
| 3. |  | A post tensioned prestressed concrete slab of effective span 7.5m is to be designed to carry an live load of 10kN/m. Provide M45 concrete and 9mm dia high tensile wires of ultimate strength 1500MPa. Design the mid span section of the slab assuming the compressive strength of concrete at transfer 35N/mm2. Assume the loss of prestress 20%. Evaluate the initial and final stresses in the section. | CO1 | 20 |
| **(OR)** | | | | |
| 4. |  | A post tensioned prestressed concrete beam of effective span 8m is to be designed to carry an live load of 8kN/m. Provide M40 concrete and 7mm dia high tensile wires of ultimate strength 1400MPa. Design the mid span section of the beam assuming the compressive strength of concrete at transfer 32N/mm2. Assume the loss of prestress 15%. Assume Type I member and width of the beam as 350mm. Evaluate the initial and final stresses in the section. | CO1 | 20 |
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| 5. | a. | Analyse the bearing strength of anchorage plate and design the end zone reinforcement for the post tensioned beam. A prestressing force of 800kN is applied by a single tendon. Size of the end block 450x450mm. Size of the bearing plate 250x250mm. Compressive strength of concrete at transfer 30N/mm2. Yield strength of steel reinforcement Fe500. | CO3 | 15 |
| b. | Differentiate between pretensioned and post tensioned members. | CO2 | 5 |
| **(OR)** | | | | |
| 6. | a. | A prestressed concrete beam of rectangular section 250mm wide and 400mm deep spanning over 6m. The beam is prestressed by straight cable carrying an effective force of 300kN at an eccentricity of 50mm. If it supports an imposed load of 6kN/m and modulus of elasticity of concrete 35kN/mm2, Compute the deflection for the following cases  i) Upward deflection  ii) Final downward deflection including the effect of creep and shrinkage | CO3 | 15 |
| b. | Write the factors affecting the deflection of prestressed concrete section. | CO2 | 5 |
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| 7. | a. | A prestressed girder of rectangular section 230mm wide and 500mm depth is to be designed to support an ultimate shear force of 200kN. The uniform prestress across the section is 10N/mm2. Use M40 concrete and Fe500 rods as shear reinforcement. Assume 10mm dia stirrups and cover to the rebar as 50mm. Analyse the section for shear considering the section is un-cracked in flexure. | CO1 | 15 |
| b. | Discuss the ways to improve the shear strength of prestressed concrete section. | CO2 | 5 |
| **(OR)** | | | | |
| 8. | a. | Draw the different types of section used for prestressed concrete beams. | CO2 | 5 |
| b. | Discuss in detail the application of prestressed precast concrete in construction with examples. | CO2 | 15 |
|  | | **Compulsory**: |  |  |
| 9. |  | Design a suitable section for the tie member of a prestressed concrete truss to carry a design tensile force of 300kN. Assume the permissible compressive stress in concrete at transfer as 25N/mm2. Loss of pre-stress 20%. High tensile steel wires of 12mm dia with an ultimate strength of 1600N/mm2 is used for prestressing. Direct tensile strength of concrete 6N/mm2. Estimate the factor safety against collapse and cracking. | CO1 | 20 |