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

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

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| **Code :** | **18CE3034** | **Duration :** | **3hrs** |
| **Sub. Name :** | **DESIGN OF PRESTRESSED CONCRETE STRUCTURES** | **Max. Marks :** | **100** |

**ANSWER ANY FIVE QUESTIONS (5 x 16 = 80 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Explain the factors affecting the deflection of PSC members. | CO1 | 6 |
| b. | A rectangular concrete beam 300mm wide, 600mm deep is prestressed with 24 Numbers of 7mm diameter wires, having zero eccentricity at supports and 150mm eccentricity at mid span. The profile of the tendons is parabolic. The effective prestressing force is 1500 kN. The beam has to support a live load of 18 kN/m. The beam is simply supported with a span of 12m. Find stress distribution at mid span using (i) stress concept, (ii) strength concept and (iii) load balancing concept. | CO1 | 6 |
| c. | Describe the layouts of the cables to be used in PSC members. | CO1 | 4 |
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| 2. | a. | Explain the behavior of PSC flexural members. | CO2 | 4 |
| b. | A pretensioned prestressed concrete beam of rectangular section is required to support a design ultimate moment of 100 kNm. Design the section using M50 grade concrete, if yield stress of steel is 1600 MPa. | CO2 | 8 |
| c. | Explain the procedure of finding ultimate flexural strength of PSC members. | CO2 | 4 |
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| 3. | a. | A continuous prestressed concrete beam ABC (AB = BC = 10m) has a uniform rectangular cross section with a width of 100mm and a depth of 300mm. The cable carrying an effective prestressing force of 360 kN is parallel to the axis of the beam and located at 100mm from the soffit.   1. Determine the secondary and resultant moment at the central support B. 2. If the beam supports an imposed load of 1.5 kN/m, calculate the resultant stresses at top and bottom of the beam at B. 3. Locate the resultant line of thrust through beam AB. | CO3 | 8 |
|  | b. | A continuous prestressed concrete beam ABC (AB = BC = 10m) has a uniform rectangular cross section with a width of 200mm and a depth of 500mm. The beam is prestressed by a parabolic cable, concentric at end supports and having an eccentricity of 100mm towards the soffit of the beam at centre and 200mm towards the top of the beam at mid support B. The cable carrying an effective prestressing force of 500 kN  i) Show that the cable is concordant.  ii) Locate the pressure line in the beam when, in addition to its self weight, it supports an imposed load of 5.6 kN/m. | CO3 | 8 |
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| 4. | a. | Design a slab for a hall of size 8m x 16m. The slab has to support a live load of 5 kN/m2. Use M40 concrete. The yield stress in tendons is 1500 MPa. Assume all other relevant data. | CO4 | 6 |
| b. | A high tensile cable comprising 12 strands of 15mm diameter with an effective force of 2500 kN is anchored concentrically in an end block of a post tensioned beam. The end block is 400mm wide and 800mm deep and the anchor plate is 200mm wide and 260mm deep. Design suitable anchorage zone reinforcement. | CO4 | 6 |
|  | c. | Explain the design concept of railway sleepers. | CO4 | 4 |
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| 5. | a. | Describe the design concept of prestressed concrete pipes. | CO5 | 8 |
| b. | Design a compression member to carry an axial force of 4000 kN and bending moment of 600 kNm. Use M40 concrete. The yield stress in tendons is 1500 MPa. Assume all other relevant data. | CO5 | 8 |
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| 6. | a. | Differentiate between Type I, II and III structures in a PSC beam analysis. | CO2 | 6 |
| b. | Explain the procedure of design of PSC beam subjected to shear. | CO2 | 6 |
| c. | Describe the codal provisions for torsion in a PSC beam. | CO2 | 4 |
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| 7. | a. | Explain the concept of linear transformation in continuous beams with examples. | CO3 | 8 |
| b. | Design a prestressed cantilever beam of span 3m subjected to UDL of 36kN/m. Use M50 concrete. Assume all other relevant data. | CO3 | 8 |
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| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | |
| 8. | a. | A prestressed concrete beam of rectangular section 100mm wide and 200mm deep has effective span of 5m. The beam is prestressed by tendons with their centroids coinciding with the bottom kern. The initial force in the tendons is 150 kN. The loss is 15%. The beam is incorporated in a composite T beam by casting a top flange of breadth 400mm and thickness 40mm. If the composite beam supports a live load of 8 kN/m2, calculate the resultant stresses developed in the precast and in situ cast concrete assuming the pretensioned beam as (i) propped and (ii) unpropped. Assume modulus of elasticity for prestressed concrete as 35 kN/mm2 and in situ concrete as 28kN/mm2 | CO4 | 16 |
|  | b. | State the advantages of partial prestressing. | CO4 | 4 |