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



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec – 2017**

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| **Code :** | **16CE3018** | **Duration :** | **3hrs** |
| **Sub. Name :** | **DESIGN OF PRESTRESSED CONCRETE STRUCTURES** | **Max. marks :** | **100** |

**(IS 1343:2012 and IS456:2000 are permitted)**

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

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | How would you plan for instability that can occur during erection of a Prestressed concrete girder. | CO1 | 5 |
| b. | A prestressed concrete beam 300 mm wide and 400 mm deep is prestressed with wires (area 350 mm2) located at a constant eccentricity of 50 mm and carrying an initial stress of 1000 N/mm2. The span of the beam is 10m. Calculate the percentage loss of stress in wires if (a) the beam is pretensioned,and (b) the beam is post-tensioned using the following data:  Ec = 35 kN/mm2, Es = 210 kN/mm2  Relaxation of steel stress = 5 percent of the initial stress  Shrinkage of concrete = 300 x 10-6 for pretensioning and 200 x 10-6 for post tensioning  Creep coefficient = 1.6  Slip at anchorage = 1 mm  Frictional coefficient for wave effect = 0.0015 per m | CO2 | 15 |
| (OR) | | | | |
| 2. | a. | Enumerate the considerations that affect the design details of a pretensioned concrete beam. | CO1 | 5 |
| b. | Determine the limit state moment of Resistance of the midspan section of an I beam for the following data:  Breadth of the top flange = 600 mm  Thickness of top flange = 120 mm  Thickness of web = 100 mm  Breadth of bottom flange = 400 mm  Thickness of bottom flange = 200 mm  Clear depth of web = 550 mm  Eccentricity of prestressing wire = 358.48 mm below the centroidal axis  Area of prestressing steel = 2 Freyssinet cables of 7mm diameter wires  Initial Prestressing force = 1213361 N  fck = 45 MPa and 5 mm HTS wires with ultimate stress of 1600 N/mm2  Find also the Factor of Safety | CO2 | 15 |
| 3. | a. | How would you recognize the influencing paremeters of deflection in a prestressed concrete beam. | CO1 | 5 |
|  | b. | Determine the Limit State Moment of Resistance of the midspan section of a slab using codal method as well as theoretical method for the following data:  i. Effective span = 12 m ii. Live load of 20 kN/m iii. M45 grade of concrete and 7mm diameter high tensile wires of ultimate strength 1520 MPa, The cube strength of concrete is 35.6 N/mm2 iv.Breadth b = 1000 mm v. Depth D = 440 mm vi. Eccentricity of prestressing wire = 138mm below the centroidal axis. vii.Area of prestressing steel = 6 Freyssinet cables of 7 mm diameter wires. viii. Initial Prestressing force = 3059933 N  Check whether this section has adequate safety factor with respect to limit state of collapse. | CO2 | 15 |
| (OR) | | | | |
| 4. | a. | How would you check the safety of a prestressed concrete beam at  transfer stage against deflection. | CO2 | 5 |
|  | b. | Design a composite T beam for a span of 10m with a beam spacing of 1.2m c/c. The expected loss of prestress is 20%. The live load on the beam is 35 kN/m. The grade of concrete adopted is M45 and HTS wires of 5 mm diameter are used. | CO2 | 15 |
| 5. | a. | Discuss about the terms ‘pressure line and concordant cable’ | CO1 | 5 |
|  | b. | A rectangular beam of cross section 350 mm x 800 mm is subjected to an effective prestressing force of 2000 kN acting at the centroid of the section. Take fci = fck = 35 MPa for ties and expected loss of prestress as 20%. The cables pass through a steel plate symmetrically in an area of 200 mm x 300 mm. Design the anchor plate and the reinforcements for bursting and spalling. | CO2 | 15 |
| (OR) | | | | |
| 6. | a. | How would you apply the design rules for torsion in prestressed concrete beams? | CO3 | 5 |
|  | b. | Sketch the cable profile diagram for an I section having the following dimensions  Breadth of the top flange = 500 mm  Thickness of top flange = 100 mm  Thickness of web = 120 mm  Breadth of bottom flange = 350 mm  Thickness of bottom flange = 180 mm  Clear depth of web = 500 mm  Eccentricity of prestressing wire = 278.3 mm below the centroidal axis  Prestressing steel = 3 Freyssinet cables of 7 mm diameter wires  Initial Prestressing force = 1446588 N  Live load on the beam = 15 kN/m  Span of the beam = 15 m | CO3 | 15 |
| 7. | a. | Indicate how detailing of reinforcement (Untensioned) in Prestressed Concrete could be done. | CO1 | 5 |
|  | b. | Enumerate the design procedure of prestressed concrete flat slab without column drop. | CO2 | 15 |
| (OR) | | | | |
| 8. | a. | List the different types of prestressed concrete sleepers and their applications | CO1 | 10 |
|  | b. | Present in detail the application of prestressing in pile foundation | CO2 | 10 |
|  | | **Compulsory:** |  |  |
| 9. |  | How would you investigate the shrinkage and creep losses based on the codal norms with required explanation. | CO2 | 20 |

ALL THE BEST