



## End Semester Examination – Nov/Dec – 2016

**Code :** 16CE3018  
**Sub. Name :** Design of Prestressed Concrete Structures

**Semester :** 2016-17 ODD  
**Duration :** 3hrs  
**Max. marks :** 100

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

| Q. No.      | Sub Div. | Questions   | Course Outcome | Marks |
|-------------|----------|---|----------------|-------|
| 1.          | a.       | Suggest a suitable norms for deciding a cross section of a Post tensioned Prestressed concrete I girder for an MD/ML ratio of 0.7 with sketch.  | Co1            | 5     |
|             | b.       | Derive the expressions for determining of moment of resistance of an I beam showing the different cases with necessary stress and strain diagrams   | Co2            | 5     |
| <b>(OR)</b> |          |   |                |       |
| 2.          | a.       | Comment on the losses due to creep with respect to IS 1343-2012.  | Co1            | 5     |
|             | b.       | A post tensioned concrete beam, 200mm wide and 400mm deep, is prestressed by four cables, each with a cross-sectional area of $78.5\text{mm}^2$ and with an initial stress of $1200\text{N/mm}^2$ . All the three cables are straight and located 100mm from the soffit of the beam if the modular ratio is 6, calculate the loss of stress in the four cables due to elastic deformation of concrete for only the following cases.<br><br>i) Simultaneous tensioning and anchoring of all the three cables and<br>ii) Successively tensioning of the three cables, one at a time   | Co2            | 15    |
| 3.          | a.       | Discuss the significance of the different methods in the design of an end block.  | 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:<br>a) Effective span = 12m<br>b) Live load of 20kN/m<br>c) M45 grade of concrete and 7mm diameter high tensile wires of ultimate strength 1520 MPa, The cube strength of concrete is $35.6\text{N/mm}^2$<br>d) Breadth b = 1000mm<br>e) Depth D = 440mm<br>f) Eccentricity of prestressing wire = 138mm below the centroidal axis<br>g) Area of prestressing steel = 6 Freyssinet cables of 7mm diameter wires<br>h) Initial Prestressing force = 3059933N<br>Check whether this section has adequate safety factor with respect to limit state of collapse. | Co2            | 15    |
| <b>(OR)</b> |          |   |                |       |
| 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 8m with a beam spacing of 1m c/c. The expected loss of prestress is 20%. The live load on the beam is 45kN/m. The grade of concrete adopted is M45 and HTS wires of 5mm diameter are used.  | Co2            | 15    |

|                           |    |   |     |    |
|---------------------------|----|---|-----|----|
| 5.                        | a. | State how would you obtain a concordant cable in a statically indeterminate beam.   | Co1 | 5  |
|                           | b. | A rectangular beam of cross section 350mm x 800mm is subjected to an effective prestressing force of 2000kN acting at the centroid of the section. Take $f_{ci} = f_{ck} = 35\text{MPa}$ for ties and expected loss of prestress as 20%. The cables pass through a steel plate symmetrically in an area of 200mm x 300mm. Design the anchor plate and the reinforcements for bursting and spalling. | Co2 | 15 |
| <b>(OR)</b>               |    |   |     |    |
| 6.                        | a. | How would you use the kern lines for locating the position of prestressed concrete cables?  | Co3 | 5  |
|                           | b. | Bringout the procedure for drawing the cable profile, kern lines, cable zone and explain how would you practically provide cables stating the IS codal norms.   | Co3 | 15 |
| 7.                        | a. | What are the salient design features of a flat slab?  | Co1 | 5  |
|                           | b. | Enumerate the design procedure of a one way prestressed concrete slab with necessary diagrams.  | Co2 | 15 |
| <b>(OR)</b>               |    |   |     |    |
| 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 |
| <b><u>Compulsory:</u></b> |    |   |     |    |
| 9.                        | a. | How would you investigate the shrinkage and creep losses based on the codal norms with required explanation.  | Co2 | 20 |

### Course Outcome:

Co1: Understand the systems of prestressing and behavior of structural elements

Co2: Analysis and design Prestressed concrete structural elements

Co3: Interpret the design concepts in solving practical problems

ALL THE BEST