DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

Supplementary End Semester Examination – Summer 2022

Course: B. Tech. **Branch: Civil Engineering** **Semester: VII**

Subject Code & Name: *BTCVC701 Design of Concrete Structures - II*

Max Marks: 60 **Date: 13/08/2022** **Duration: 3.45 Hrs.**

Instructions to the Students:

1. *All the questions are compulsory.*
2. *The level of question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*
5. *IS 456:2007, IS 1343:2012 is allowed.*

		(Level/ CO)	Marks
Q. 1	**Solve Any Two of the following.**		
A)	Define the term '*Torsion*'? Explain the difference between '*primary torsion'* and '*secondary torsion'* with example?	**CO1**	**6 M**
B)	How is *torsional stiffness* estimated for '*secondary torsion*'?	**CO1**	**6 M**
C)	Estimate the torsional stiffness of reinforced concrete beam element, having span L = 6.0 m and a rectangular section with width b = 200 mm and overall depth D = 500 mm. Assume M25 concrete. Compare the torsional stiffness with the flexural stiffness, 4EI / L for the same beam element.	**CO1**	**6 M**
Q.2	**Solve Any Two of the following.**		
A)	Design the reinforcement in a column of size 450 mm x 600 mm, subject to an axial load of 2000 kN under service load and live loads. The column has an unsupported length of 3 m and is braced against sideway in both directions. Use M 20 concrete and Fe 415 steel.	**CO2**	**6 M**
B)	Design the reinforcement in a spiral column of 400 mm diameter subjected to a factored load of 1500 kN. The column has an unsupported length of 3.4 m and is braced against sideway. Use M 25 concrete and Fe 415 steel.	**CO2**	**6 M**
C)	A corner column (400 mm x 400 mm), located in the lowermost storey of a system of braced frames, is subjected to factored loads: P_u = 1300 kN, M_{ux} = 190 kN and M_{uy} = 110 kN-m. The unsupported length of the column is 3.5 m. Design the reinforcement in the column, assuming M 25 concrete and Fe 415 steel.	**CO2**	**6 M**
Q. 3	**Solve Any Two of the following.**		
A)	Why did the early attempts in prestressing using ordinary mild steel fail? Distinguish between the terms: a) Uniaxial, b) Biaxial and c) Triaxial prestressing?	**CO 3**	**6 M**
B)	Explain the principle of post tensioning and various post tensioning systems based on wedge action with neat sketches?	**CO 3**	**6 M**
C)	Explain with sketches 'Hoyer`s long line system of pre tensioning'.	**CO 3**	**6 M**

Q.4 Solve Any Two of the following.

A) An Unsymmetrical I – section beam is used to support an imposed load of 2 kN/m over a span of 8 m. The section details are top flange, 300 mm wide and 60 mm thick; bottom flange, 100 mm wide and 60 mm thick; thickness of the web = 80 mm; overall depth of the beam = 400 mm. At the centre of the span, the effective prestressing force of 100 kN is located at 50 mm from the soffit of the beam. Estimate the stresses at the centre of span section of the beam for the following load conditions: **CO 4** **6 M**

a) Prestress + self – weight
b) Prestress + self – weight + live load

B) A rectangular concrete beam 250 mm wide by 300 mm deep is prestressed by a force of 540 kN at a constant eccentricity of 60 mm. The beam supports a concentrated load of 68 kN at the centre of a span of 3 m. Determine the location of the pressure line at the centre, quarter span and support sections of the beam. Neglect the self – weight of the beam. **CO 4** **6 M**

C) Distinguish between '*cable line'* and '*pressure line'* with sketches in typical prestressed concrete beam. **CO 4** **6 M**

Q. 5 Solve Any Two of the following.

A) A pre – tensioned concrete beam, 100 mm wide and 300 mm deep, is prestressed by straight wires carrying an initial force of 150 kN at an eccentricity of 50 mm. the modulus of elasticity of steel and concrete are 210 and 35 kN/mm^2 respectively. Estimate the % loss of stress in steel due to elastic deformation of concrete if the area of steel wires is 188 mm^2. **CO 3** **6 M**

B) A concrete beam is post – tensioned by a cable carrying an initial stress of 1000 N/mm^2. The slip at the jacketing end was observed to be 5 mm. The modulus of elasticity of steel is 210 kN/mm^2. Estimate the % loss of stress due to anchorage slip if the length of the beam is__ **CO 3** **6 M**

(a) 30 m; and (b) 3 m.

C) List and explain various types of loss of prestress in pretensioned and post tensioned members. **CO 3** **6 M**

******* End *******