



### VII SEMESTER B.TECH.

### END SEMESTER EXAMINATIONS, NOV/DEC 2018

### SUBJECT: PRESTRESSED CONCRETE DESIGN [CIE 4016]

### REVISED CREDIT SYSTEM

Time: 3 Hours

MAX. MARKS: 50

#### Instructions to Candidates:

- ❖ Answer **ALL** the questions.
- ❖ Use of **IS 1343-1980, 2012** are allowed.
- ❖ Missing data may be suitably assumed.

1A.	List the reasons for higher Shear resistance of PSC members as compared to corresponding RCC members.	03	CO3
1B.	A PSC pretensioned beam of span 10m is pre-stressed HTS bars of total area 500mm <sup>2</sup> . If all bars have linearly varying cable profile with zero eccentricity at ends and an eccentricity of 100mm at mid span. Initial prestress induced in bars is 675 N/mm <sup>2</sup> . Compute losses of pre-stress and total percentage of loss. Use following data: Steel: HTS bars ; Concrete M50 grade; Age of loading- 28 days; Characteristic strength of steel $f_p = 900 \text{ N/mm}^2$ ; Area of Cross section $120 \times 10^3 \text{ mm}^2$ ; Moment of Inertia of cross section $10 \times 10^{10} \text{ mm}^4$	07	CO1
2A.	A double overhanging beam has left and right overhanging spans of 3m and middle supported span is 6m. Over hanging spans are loaded with an UDL of 10 kN/m and supported span is loaded with an UDL of 15 kN/m. Sketch the cable profile for the beam.	03	CO1
2B.	A un symmetrical 'I' section of Pretensioned PSC beam was designed for a single span bridge girder spanning 12m. Sectional properties are given in <b>Table 1</b> . Below. M40 grade of concrete is used with an $f_{ci}$ of 28 N/mm <sup>2</sup> . The beam is partially prestressed. The cable is parabolic with zero eccentricity at supports, and 200mm eccentricity at midspan. The beam carries an UDL of 17kN/m throughout the span. The prestressing force in tendons is 800kN and loss of prestress is 21%. Draw the stress distribution diagram at transfer and working stage and check for permissible limits as per IS 1343-2012	07	CO2
3A.	Check for the limit state of collapse for simply supported pretensioned beam of span 11m loaded with a working load of 15kN/m. The beam is pre-stressed by 30 indented wires of 5mm diameter whose characteristic strength is 1600N/mm <sup>2</sup> . The effective cover to the centroid of pre-stressing steel is 275mm. The grade of concrete is M40. The sectional properties are as given in <b>Table-1</b> .	08	CO3
3B.	A prestressed beam is designed for a live load of 12 kN/m over span of span of 12m. The grade of concrete used is M45 and initial prestress induced is 850 kN with a loss of 20.5%. A parabolic cable which is concentric at supports and having maximum eccentricity of 250mm at mid span is provided as tendon. Designed section is as given in <b>Table-1</b> . If coefficient of creep is 1.6, check for limit state serviceability in	02	CO2

	long term deflection according IS 1343-2012.		
<b>4A.</b>	The End block of post tensioned beam has cross section $480\text{mm} \times 480\text{mm}$ is prestressed with an effective prestress of 720kN. Two anchor plates having dimension $90\text{mm} \times 90\text{mm}$ are placed with their centroid at 240 mm from vertical edge and 120 mm from top & bottom edge respectively at the end face. M45 grade of concrete with $30\text{N/mm}^2$ strength at transfer is used for the beam. Design End block reinforcement using HYSD steel.	<b>04</b>	<b>CO3</b>
<b>4B.</b>	A PSC beam having sectional properties as in <b>Table-1</b> is pre-stressed using parabolic cable which is having zero eccentricity at supports and 250mm below cgc at mid span. The beam is simply supported over a span of 11m and carries a super imposed load of 12 kN/m over the whole span. M40 grade concrete is used for the beam and is prestressed with an effective prestress of 800 kN. Shear resistance at section cracked in flexure is 110 kN. Check limit state of collapse in shear according to IS1343-2012 and design the shear reinforcement if required.	<b>06</b>	<b>CO3</b>
<b>5.</b>	Design a simply supported type-1 post-tensioned PSC beam of span 10.5 m loaded with a working load of 14.7 kN/m. Grade of concrete used is M40 with an initial strength of $28\text{ N/mm}^2$ . Assume loss of prestress as 20%. Take Trial cross-section as given in <b>Table-1</b> .	<b>10</b>	<b>CO3</b>

<b>Table- 1</b>	
Top flange	$450\text{mm} \times 100\text{mm}$
Web	$100\text{mm} \times 775\text{mm}$
Bottom flange	$150\text{mm} \times 175\text{mm}$
$y_t$	438.97mm
A	$149 \times 10^3\text{ mm}^2$
I	$1.82 \times 10^{10}\text{ mm}^4$