U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

October 2024 Supplementary Examinations

Programme: B.E. **Semester: VI**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 22CV6PCPSC **Max Marks: 100**
Course: Design of Pre stressed concrete Structures

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.
3. Use of IS 1343-2012 permitted

		UNIT – I	*CO*	*PO*	Marks
1	a)	Explain with two examples the concept of Load Balancing in Pre stressed concrete members.	*CO* 1	*PO1*	**4**
	b)	Explain 'Thrust line' and state how this concept is useful in design of PSC sections.	*CO* 1	*PO1*	**4**
	c)	A pre stressed concrete beam of rectangular section 250 mmx 650 mm, 12 m long supports a live load of 10KN/m in addition to its own weight. The beam is pre stressed by a cable having high tensile wires of 2000 mm^2 area stressed to 700N/mm^2. The cable is located at a distance of 150 mm from the soffit of the beam throughout the length of beam. Determine the shift in the pressure line at one quarter span and centre of span when the beam supports the service load. Calculate the stresses at the mid span section	*CO* 1	*PO1*	**12**
		OR			
2	a)	Explain briefly Thermoelectric pre stressing.	*CO* 1	*PO1*	**6**
	b)	A pre stressed concrete I section is used as a post tensioned simply supported beam of span 20 m. It is having pre stress cables of area 225 mm^2 at a depth of 25 mm from the top of the section and an area of 850 mm^2 at a depth of 50 mm the bottom of the section which has a total depth of 975 mm. The initial pre stress in the cables is 1500 N/mm^2 with a loss of 250 N/mm^2. The permissible stress in concrete in concrete under working condition are 17 N/mm^2 (compression) at the top of the section and 1.7 N/mm^2 (Tension) at the bottom. Calculate the total permissible load on the beam given Ixx= $15x10^9$ mm^4, area of cross section =1200 mm^2. The neutral axis of the section is at a depth of 546 mm from the bottom of the section.	*CO* 1	*PO1*	**14**

			UNIT – II			
	3	a)	A post tensioned pre stressed concrete beam 200mmx 400 mm is pre stressed with Aps=200 mm^2, stressed to an initial pre stress of 1100 N/mm^2 at a constant eccentricity of 75 below the centroid of the section. The span of the beam is 10 m. Calculate the total loss of pre stress and % loss of pre stress. Adopt IS 1343 -2012 provisions. E_c= 35KN/mm^2, E_s=200 KN/mm^2, Relaxation of stress in steel is normal, Characteristic strength of tendons=1650 N/mm^2, anchorage slip=2.5 mm, f_{ck} = 50 N/mm^2, Relative humidity = 50% , atmospheric condition is dry , wobble co efficient is 0.0015/m	***CO*** 1	***PO1***	**12**
		b)	A PSC beam of rectangular section 150 mm x 300 mm is pre stressed by a parabolic cable carrying an initial force of 250KN. The cable has an eccentricity of 75 mm below the centroidal axis at mid span and 25 mm above the centroidal axis at supports. If the span of beam is 12 m and live load is 3.2 KN/m, estimate the short term deflection and long term deflection after 6 months at mid span. Take Ec=38 GPa , creep co efficient as 1.6 , loss of pre stress is 25% after 6 months	***CO*** 1	***PO1***	**8**
			UNIT – III			
	4	a)	The cross section of a symmetrical I-section PSC beam is 300 mmx750 mm overall size with flanges and web 100 mm thick. The beam is post tensioned by a cable containing 50 wires of 5mm diameter at an eccentricity of 250 mm. The 28-day strength of concrete in compression is 40 N/mm^2 and UTS of wires is 1700 $N/mm^{2.}$ Assuming grouting is 100% effective determine the safe udl on a simply supported span of 20 m	***CO*** 2	***PO1***	**8**
		b)	A pre stressed concrete beam 250 mm wide and 1500mm deep, carries an effective pre stress of 1362 KN. Shear force at the section under working load is 771 KN. Effective pre stress at that section is taken to be an angle of $\sin^{-1}$ (1/6). The extreme fiber stress is 7N/mm^2 at top and zero at the bottom. If the pre stress is 0.7N/mm^2 find the spacing of 12 mm vertical stirrups.	***CO*** 2	***PO1***	**12**
			UNIT –I V			
	5		Design a symmetrical I Section for a pre tensioned beam of span 12 m carrying a super imposed load of 30 KN/m. Assume compressive stress of concrete as 15 MPa at transfer and 12 MPa at working load. No tensile stress is allowed in the concrete The initial stress in steel is not to exceed 1000 MPa Assume the loss of pre stress as 15% .Assume f_{ck}=50 MPa, f_p= 1600 $N/mm^{2.}$	***CO*** 2	***PO2***	**20**

			OR			
	6	a	Obtain expressions for minimum possible depth , pre stressing force and corresponding eccentricity of PSC beam	***CO*** 1	***PO1***	**6**
		b)	A rectangular post tensioned PSC girder of span 12 m is to carry an imposed load of 20 KN/m Limiting breadth of the beam to 300 mm and loss of pre stress as 20% calculate; i)The minimum possible depth of beam ii) For the section provided calculate the minimum pre stressing force and the corresponding eccentricity Assume the structure is Class -1 type and belongs to zone-1 , permissible stresses shall be as per the provisions of IS 1343-2012. Assume f_{ck}=50 MPa, f_p= 1600 N/mm$^{2.}$	***CO*** 2	***PO2***	**14**
			UNIT -V			
	7	a)	Explain briefly the following with neat sketches; (i)transmission length and Hoyer's effect (ii) Anchorage zone reinforcement	***CO*** 1	***PO1***	**08**
		b)	A high tensile cable comprising of 12 strands of 15 mm diameter with an effective pre stressing force of 2500 KN is anchored concentrically to an end block of a post tensioned beam. The end block is 400 mm wide and 800 mm deep and anchor plate is 200mm wide and 300 mm deep Design a suitable anchorage zone reinforcement using Fe415 HYSD bars as per IS 1343 code.	CO2	**PO2**	**12**

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