Reg.No. _____

Karunya 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 – 2016

Code : 14CE3021
Sub. Name : Prestress 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.	Investigate the losses due to elastic shortening for a post tensioned concrete beam, 100mm wide and 300mm deep, is prestressed by three cables, each with a cross-sectional area of 50mm^2 and with an initial stress of 1200N/mm^2. All the three cables are straight and located 100mm from the soffit of the beam if the modular ratio is 6	CO2	**14**
	b.	State any one method of external prestressing?	CO1	**2**
	c.	List out the various short term losses	CO1	**2**
	d.	How do you apply prestress concept in a bi-cycle wheel	CO1	**1**
	e.	Indicate the meaning of unbounded tendons	CO1	**1**
		(OR)		
2.	a.	Report in which page and clause the loss due to relaxation of steel is stated in the code book	CO1	**1**
	b.	Under what circumstances post-tensioned beam will undergo elastic shortening	CO2	**1**
	c.	Sketch the cross section recommended by Military Engineering Hand book for M_D/M_L ratio of 0.7 for preliminary design of prestressed concrete girders	CO1	**2**
	d.	Calculate the permissible compressive stress at transfer for a concrete of grade M40 using IS code when the cube compressive stress at transfer is 32.5MPa	CO1	**2**
	e.	Evaluate the losses due to elastic shortening in a post tensioned concrete beam 100mm wide and 300mm deep, spanning over 10m is stressed by successively tensioning and anchoring of three cables 1,2 and 3, respectively. The cross sectional area of each cable is 200mm^2 and initial stress in the cable is 1200N/mm^2, α_c = 6. The first cable is parabolic with an eccentricity of 50mm below the centroidal axis at the centre of span and 50mm above the centroidal axis at the support section. The second cable is parabolic with zero eccentricity at the support and and eccentricity of 50mm at the centre of the span. The third cable is straight with a uniform eccentricity of 50mm below the centroidal axis. The cables are successively tensioned and anchored.	CO2	**14**
3.	a.	Differentiate between full prestressing and partial prestressing	CO1	**5**
	b.	A Prestress concrete beam 200m wide and 300mm deep is used over an effective span of 6m to support an imposed load of 4 kN/m. The density of concrete is 24 kN/m^3. Find the magnitude of the eccentric prestressing force located at 100mm from the bottom of the beam which would nullify the bottom stress dut to loading.	CO2	**15**
		(OR)		
4.	a.	Explain the various methods of flexural failure encountered in pre stressed concrete members.	CO3	**15**
	b.	Explain the assumptions made in the analysis of composite sections	CO3	**5**
5.	a.	A concrete beam with a rectangular section 300mm wide and 500mm deep is prestressed by 2 post tensioned cables of area 600mm^{2}each. Initially stressed to	CO2	**15**

		1600 N/mm^2. The cables are located at a constant eccentricity of 100mm throughout the length of the beam having span of 10m. The modulus of elasticity of steel and concrete is 210 and 38 kN/mm^2 respectively. (a) Neglecting all losses, find the defelection at the centre of span when it is supporting its own weight. (b) Allowing 20% loss in prestress, find the final deflection at the centre of span when it carries an imposed load of 18 kN/m.		
	b.	A concrete beam 40m span is post tensioned by a cable by a cable carrying an initial stress of 1200N/mm^2. The slip at the jacking end was observed to be 7mm. The modulus of elasticity of steel is 210kN/mm^2. Estimate the percentage loss of stress due to anchorage slip.	CO3	**5**
		(OR)		
6.	a.	Define differential shrinkage. Explain its importance in composite construction	CO3	**5**
	b.	A two span continuous prestressed concrete beam ABC (AB= BC = 15m) has a uniform cross section with a width of 250mm and depth of 600mm. A cable carrying an effective prestressing force of 500 kN is parallel to the axis of the beam located at an eccentricity of 200mm. (a) Determine the secondary and resultant moment developed at the mid – support section B. (b) If the beam supports an imposed load of 2.4 kN/m, calculate the resultant stresses developed at the top and bottom of the beam B. Also locate the resultant line of thrust through the beam AB	CO3	**15**
7.	a.	Sketch the different layouts of prestressing cables and state where they are applied	CO2	**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 = 600mm Thickness of top flange = 120mm Thickness of web = 100mm Breadth of bottom flange = 400mm Thickness of bottom flange = 200mm Clear depth of web = 550mm Eccentricity of prestressing wire = 358.48mm below the centroidal axis Area of prestressing steel = 2 Freyssinet cables of 7mm diameter wires Initial Prestressing force = 1213361N fck = 45MPa and 5mm HTS wires with ultimate stress of 1600N/mm2 Find also the Factor of Safety	CO3	**15**
		(OR)		
8.	a.	State the advantages and disadvantages of composite beams	CO3	**5**
	b.	A precast prestressed inverted T section is to be used in a composite slab of total depth 450mm and width 230mm. The inverted T consists of bottom flange of width 230mmx100mm thick and web of 300mm depth and 100mm width. The composite slab supports a live load of 12KN/m^2 over a span of 9m. Prestressing force is 600KN, applied at an eccentricity of 70mm. M40 AND M20 concrete are used for precast and in situ concrete respectively. Determine the stresses at mid span section of the composite slab.	CO2	**15**
		<u>Compulsory:</u>		
9.	a.	Describe the design principles of pipes.	CO2	**5**
	b.	A prestressed concrete cylindrical water tank has to store 15lakhs litres of water with a storage depth of 8m. Assuming a flexible base, design the wall thickness and the spacing of 5mm dia HTS wires for prestressing. The design should satisfy the following conditions. a. Residual compressive stress of 0.7N/mm^2 under working conditions.	CO2	**15**

		b. Cracking load factor of 1.2 and ultimate load factor of 2. c. M40 grade concrete with compressive stress of 13N/mm^2 and tensile stress of 1.7N/mm^2. d. Ultimate tensile stress of wires is 1500N/mm^2 and initially stressed to 1200N/mm^2 e. Loss of prestress=20%		

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