Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER– I (OLD course)• EXAMINATION – SUMMER 2015

Subject Code: 712007N **Date: 16/05/2015**

Subject Name: Prestressed Concrete

Time: 10:30 am to 1:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **IS 1343, IS 456-2000 permitted.**

Q.1	**(a)**	Narrate the advantages of prestressed concrete and explain the need of high strength materials in Prestressed concrete.	**07**
	(b)	State the equations which control the limits of the permissible tendon zone in a psc prismatic member with a constant prestressing force.	**07**
Q.2	**(a)**	Enlist the different types of losses in prestress in Pre-tensioning & Post-tensioning and its performance in prestressed concrete & explain Hoyerôs effect and define Transmission length.	**07**
	(b)	A concrete beam of rectangular section 200mm wide by 300mm deep is pretressed by means of high tensile steel wires of area 300mm^2, located 65 mm from the bottom of the beam & wires of area 60mm^2, located 25 mm from the top of the beam. The effective stress in wires is 850mm^2. Compute the resultant stresses at midspan section when the beam is supporting its own weight together with a live load of 7 kN/m, assuming the density of concrete as 24 kN/m^3 and the span of the beam is 6 m.	**07**
		OR	
	(b)	A precast tension beam of rectangular section is 150 mm(W) and 200 mm(D) with effective span of 6m is prestressed by a tendon with their centroid coinciding with bottom kern. The initial force in tendon is 150kN. Assume prestressed losses to be 10%. The beam is incorporated in a composite T-beam by casting a top flange of 400mm width and 40mm thickness. If composite beam supports a LL of 8kN/m^2, Calculate the resultant stresses developed in the precast and in-situ cast concrete, if pre-tensioned beam is unpropped during the casting of the slab. Consider modulus of elasticity for concrete in precast beam and in-situ cast slab same.	**07**
Q.3	**(a)**	A concrete beam of rectangular section, 250 mm wide and 650 mm overall depth is subjected to a torque of 22 kNm and a uniform prestessing force of 150kN. Calculate the maximum principal tensile stress. Assuming 18% loss of prestressing force necessary to limit the principal stress to 0.4 MPa.	**07**
	(b)	A concrete beam of rectangular section, 300 mm wide and 800 mm overall depth is subjected to a twisting moment of 30 kNm and a prestessing force of 150 kN at an eccentricity of 220 mm.Calculate the maximum principal tensile stress. If the beam is subjected to a bending moment of 110 kNm in addition to a twisting moment, calculate the maximum principal tensile stress.	**07**
		OR	

Q.3 **(a)** Aprestressed concrete beam 120 mm wide and 300 mm deep is used to support uniformly distributed live load of 2.5 kN/m over an effective span of 6m. The beam is prestressed by a straight cable carrying an effective prestressing force of 200 kN at a constant eccentricity of 50mm. Given Ec = 38 kN/mm^2, the modulus of rupture = 5 N/mm^2, area of the cable = 210 mm^2 and modular ratio = 6, estimate the deflection of the beam at the following stages: (a) working load, (b) cracking load, (c) 1.5 times the cracking load. **07**

(b) Explain the reasons to control the deflection. What are the factors that influence the deflection? **07**

Q.4 **(a)** A pretension beam 250 mm wide & 300 mm deep is prestressed by 12 wires each of 8 mm diameter initially stressed to 1200MPa with their centroid located 100 mm from the soffit. Estimate the final percentage loss due to elastic deformation,creep,shrinkage & relaxation using IS:1343-1980 code and the following data: Relaxation of steel stress = 95 N/mm^2, Es = 210 kN/mm^2, Ec = 35 kN/mm^2. **07**

(b) A prestressed concrete beam of 8 m length having 200 mm width and 450 mm depth, subjected to UDL of 50.5 kN/m (including the self weight). The beam is prestressed by a straight cable carrying a force of 300 kN and located at an eccentricity of 75 mm. Determine the location of thrust line in the beam **07**

OR

Q.4 **(a)** Explain the following terms: Cap cable, Transfer of prestress, Anchorage, Creep in concrete & Transmission length. **07**

(b) Write the advantages of prestressing long span shell structures. **07**

Q.5 **(a)** Discuss Concordant Cable profile for two span continuous beams as per theorem of three moments. **07**

(b) A rectangular beam is prestressed by a straight cable carrying an effective force of 200 kN at an eccentricity of 60 mm. The beam cross-section is 150 mm (wide) x 350 mm (deep). The beam supports a LL of 2.6 kN/m over a span of 7m. If the modulus of rupture of the concrete is 5N/mm^2, determine load factor against cracking. Density of concrete = 24 kN/m^3 **07**

OR

Q.5 **(a)** A pre-tensioned T-section has a flange 1200mm (W) and 150mm (thk). The width and depth of the rib are 300 mm and 1500 mm respectively. The high tensile steel has an area of 4000 mm^2 and is located at an effective depth of 1600 mm. If the characteristic cube strength of concrete and tensile strength of steel are 40 N/mm^2 and 1600 N/mm^2 respectively, Calculate flexural strength of T-section. **07**

(b) A concrete beam of rectangular section 180 mm wide by 400 mm deep is simply supported over a span of 8 m and is reinforced with 3 wire of 8 mm diameter. The wires are located at constant eccentricity of 80 mm and are subjected to an initial stress of 1200 N/mm^2. Calculate the percentage loss of stress in the wires if the beam is (a) pretensioned and (b) post tensioned. Es=200kN/mm^2, modular ratio = 6, slip at anchorage = 0.8 mm, Friction coefficient=0.002/m, relaxation of steel stress = 6%. Adopt creep & shrinkage coefficients as per IS: 1343 code specifications. **07**

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