Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII (NEW) - EXAMINATION – SUMMER 2018

Subject Code: 2180612 **Date: 02/05/2018**

Subject Name: Design of Prestressed Concrete Structures & Bridges(Departmental Elective - III)

Time: 10:30 AM to 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Define the terms: (1) Pretensioning (2) Tendon (3) Anchorage	**03**
	(b)	Write advantages and disadvantages of prestressed concrete	**04**
	(c)	A rectangular concrete beam of cross-section 30cm deep and 20cm wide is prestressed by means of 15 wires of 5mm diameter located 6.5 cm from the bottom of the beam and 3 wires of diameter of 5mm, 2.5cm from the top. Assuming the prestress in the steel as 840 N/mm^2, calculate the stressed at the extreme fibers of the mid span sections when the beam is supporting its own weight over a span of 6 m. If a uniformly distributed live load of 6 kN/m is imposed, evaluate the maximum working stress in concrete. The density of concrete is 24 kN/m^3	**07**
Q.2	**(a)**	Differentiate between Pretensioned and posttensioned member	**03**
	(b)	Explain the differences of prestressed concrete over reinforced concrete.	**04**
	(c)	A prestressed concrete beam with a rectangular section 120mm wide, 300mm deep supports a uniformly distributed load of 4 kN/m, which includes the self-weight of the beam. The effective span of the beam is 6 m. The beam is concentrically prestressed by cable carrying a force of 180 kN. Locate the position of the pressure line in the beam.	**07**
		OR	
	(c)	A rectangular concrete bam 250 mm wide and 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 68kN at the centre 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.	**07**
Q.3	**(a)**	Differentiate between short-term and long-term deflections of prestressed concrete beams	**03**
	(b)	List the various types of tensioning device used in prestressed concrete	**04**

	(c)	A beam of symmetrical I-section spanning 8 m has flange width of 150 mm and flange thickness of 80 mm respectively. The overall depth of the beam is 450 mm. Thickness of web is 80 mm. The beam is prestressed by a parabolic cable with an eccentricity of 150 mm at the centre of the span and zero at the supports. The Live Load on the beam is 2.5kN/m. (1) Determine the effective force in the cable for balancing the Dead Load and Live Load on the beams (2) Calculate the shift of the pressure line from the tendon centre line.	**07**

OR

Q.3	**(a)**	Explain the concept of load balancing in prestressed concrete members	**03**
	(b)	Explain the principle of post tensioning	**04**
	(c)	A prestressed concrete beam 400mm X 600mm in section has a span of 6m and is subjected to uniformly distributed load of 16 kN/m including the self-weight of the beam. The prestressing tendons are located at the lower third point and provide an effective prestressing force of 960 N. Determine the extreme fibre stresses in concrete at the mid span section.	**07**
Q.4	**(a)**	Write in brief investigation and planning to be carried out for bridge design and construction	**03**
	(b)	Give classification of bridges based on various aspects	**04**
	(c)	Design a suitable section for the tie member of a truss to support a maximum design tensile force of 600 kN. The permissible compressive stress in concrete at the transfer is 15 N/mm^2 and no tension is permitted under working load. The loss ratio is 0.8. 7 mm diameter wires of ultimate tensile strength of 1800 N/mm^2 with an initial stress of 1000 N/mm^2 may be used. The direct tensile strength of concrete is 3 N/mm^2. A load factor of 2 at the limit state of collapse and 1.25 against cracking is required.	**07**

OR

Q.4	**(a)**	Discuss the types of substructures for bridges	**03**
	(b)	Which are the preliminary data to be collected for the design of bridges	**04**
	(c)	The deck slab of a road bridge of span 10 m is to be design as a one-way prestressed concrete slab, with parallel post-tensioned cable in each of which the force at transfer is 500 kN. If the deck slab is required to support a uniformly distributed live load of 25 kN/m^2, with the compressive and tensile stress in concrete at any stage not exceeding 15 and zero N/mm^2 respectively, calculate the maximum horizontal spacing of the cable and their position at the mid span sections. Assume the loss ratio as 0.80	**07**
Q.5	**(a)**	Enlist loads acting on bridges	**03**
	(b)	Briefly discuss the IS : 1343 code provisions regarding bond and transmission length	**04**
	(c)	Describe the Grillage analogy	**07**

OR

Q.5	**(a)**	Explain the criteria for selection of type of bridge.	**03**
	(b)	Write the design principles for pre-tensioned prestressed bridge decks	**04**
	(c)	Explain forces acting on bearing. Write points are to be consider for design of bearing	**07**

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