Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 170603 **Date: 04/05/2017**

Subject Name: Structural Design-I

Time: 02:30 PM to 05:30 PM **Total Marks: 70**

Instructions:

1. **Use of SP-16(Design Aids) is NOT permitted.**
2. **Use of IS- 456-2000, IS: 800-2007 and Steel Table is permitted.**
3. **Attempt all questions.**
4. **Make suitable assumptions wherever necessary.**
5. **Figures to the right indicate full marks.**

Q.1	**(a)**	Differentiate between Balanced, Under reinforced and Over reinforced section.	**07**
	(b)	Design a short circular R.C.C. column to carry an axial load of 1500 kN. Use M20 grade concrete and Fe-415 grade steel. Show the reinforcement details with neat sketches.	**07**
Q.2	**(a)**	Design a steel column to carry an axial load of 1200 kN. The length of column is 3.0 m and fixed at both ends. Take fy = 250 N/mm^2.	**07**
	(b)	Explain various elements of Flat Slab with neat sketches. Mention advantages & Disadvantages of Flat Slab.	**07**
		OR	
	(b)	Draw the neat sketches of Lacing system, Battening system for steel columns.	**07**
Q.3	**(a)**	An unequal angle 1.5 m long, of a truss is connected to the 10 mm gusset plate. It carries ultimate tension of 230 kN. Design the section using bolted connection. Take fy = 250 N/mm^2 and f_u =410 N/mm^2.	**07**
	(b)	Design a suitable I-section for a simply supported beam of span 5 m carrying a dead load of 20 kN/m and imposed load of 40 kN/m. The beam is laterally unsupported throughout the span. Take fy = 250 N/mm^2.	**07**
		OR	
Q.3	**(a)**	Design the welded connection for an ISA 90x90x8 mm is to be connected with 10 mm thick gusset plate by 6 mm fillet weld on sides and at the end of the member to transfer tensile load of 140 kN. Take Fe 410 grade steel and field welding. Draw neat sketch of connections.	**07**
	(b)	Design a single angle discontinuous strut which is carrying factored load of 100 kN. Unsupported length of member is 3.5 m. Take fy = 250 N/mm^2.	**07**
Q.4	**(a)**	Design an isolated sloped Footing for a square R.C.C. column of size 400 mm X 400 mm carrying an axial load of 1800 kN. Safe bearing capacity of soil is 200 kN/mm^2. Use M-20 grade concrete and Fe-415 as steel reinforcement. Check for shear and bearing pressure is not required. Show the details with neat sketches	**07**
	(b)	Design a simply supported One way slab of 3m X 7m supported on 200 mm wide beams. The slab carried a 2 kN/m^2 live load and 1.2 kN/m^2 finish load. Use M20 grade of concrete and Fe 415 grade of steel. Check criteria for deflection and development length.	**07**
		OR	

Q.4	**(a)**	A simply supported R.C.C. beam of size 230 mm wide and 450mm depth with clear span of 5 m is reinforced with 4 nos. of 16 mm diameter bar and clear cover of 25 mm. Width of support is 230 mm. It is loaded by uniformly distributed load of 60 kN/m. Design the Shear Reinforcement using 2 legged 6 mm mild steel stirrups.	**07**
	(b)	An RCC slab of span 4m x6m has only One long edge continuous and all other edges discontinuous. The slab is 150 mm thick. It is loaded by live load of 3 kN/m^2 and Floor finish load of 1 kN/m^2. Design main steel at bottom of 4m span and check for deflection assuming support width of 230mm.	**07**
Q.5	**(a)**	A rectangular beam 300 mm wide and 450 mm deep is reinforced with 2-12 mm diameter bars at top and 2-16 mm diameter bars at the bottom, each provided with an effective cover of 40 mm. Take M20 grade of concrete and Fe 415 grade of steel. Determine the resistance of beam in pure torsion.	**07**
	(b)	A steel column ISMB600 is loaded by the factored axial compressive load 600 kN. Design the suitable slab base for the column if it is resting on the concrete of the grade M25.	**07**

OR

Q.5	**(a)**	A singly Reinforced beam of span 4 m has effective section of 300 x 450 mm, reinforced with 3-18 mm diameter bars at effective cover of 50 mm. Take M20 grade of concrete and Fe 415 grade of steel. Find safe load on beam.	**07**
	(b)	Determine the load carrying capacity of a compound column consisting of ISMB400 @ 61.6kg/m with one cover plate of 30 x20 mm on each flange and having a length of 5m. One end of the column is fixed and other is pinned. Assume fy = 250 N/mm^2.	**07**

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