Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV(OLD) • EXAMINATION – WINTER 2016

Subject Code:141301 **Date:19/11/2016**

Subject Name:Design Of Environmental Structure

Time:02:30 PM to 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of IS-456, IS-800, IS-875: Part-I, II, III, SP-6 & SP-16 is permitted.**
5. **For analysis and design purpose, take concrete grade: M20, steel grade: Fe_{415} in RCC design and yield stress of steel: f_y = 250 MPa in steel design if not given in the data.**
6. **Take shear stress in fillet weld as 108 MPa, wherever necessary.**

Q.1	**(a)**	Design a double unequal angle tie member connected on same side of gusset plate 8 mm thick connected by 20 mm Φ pds rivets. Members are also connected by tacking rivets. The axial load acting on the member is 300 kN.	**07**
	(b)	Design riveted connection for the member subjected by the axial force of 300 kN. Member comprising of 2 ISA 100x100x10 mm connected on both side of gusset plate. Use 20 mm Φ pds rivets.	**07**
Q.2	**(a)**	Find the uniformly distributed ultimate load on the beam of rectangular section 230 mm wide and 600 mm deep reinforced by 4 bars of 25mm at an effective depth of 550mm.The effective span of the beam is 5.5 m.	**07**
	(b)	Determine the efficiency of lap joint for 10 mm thick plates joined with 20 mm diameter power driven shop rivets at a pitch of 60 mm c/c.	**07**
		OR	
	(b)	Design a singly reinforced rectangular concrete beam with effective span 4.2 m supported on 230 mm wall. Take working live load of 4.0 kN/m and sketch the reinforcement details.	**07**
Q.3	**(a)**	Write short notes on Live load on roofs, Erection loads, Mild steel bars, HYSD bars, TMT bars.	**07**
	(b)	Design a simply supported steel beam of 5.0 m to carry a UDL of 40 kN/m on entire span. Check for shear and deflection.	**07**
		OR	
Q.3	**(a)**	Explain pre-stressing. Explain pre-tensioning and post-tensioning. Also give examples of structural elements where these methods are suitable.	**07**
	(b)	Design a short axially loaded square RCC column of size 600 mm for a service load of 2500 kN. The grades of concrete and steel are M20 and Fe415 respectively. The effective length of the column is 3.5 m.	**07**
Q.4	**(a)**	Sketch the sectional plan, elevation and side view of (i) column to beam and (ii) beam to beam framed connection.	**07**
	(b)	The tie of a roof truss carries an axial tension of 250 kN. Design the section of the member and also the connection of the member to 12 mm thick gusset plate. Use 20 mm diameter rivets.	**07**
		OR	
Q.4	**(a)**	Design a built up column made of two channel section placed back to back to carry axial load of 1500 kN. The effective length of the column is 5.6 m.	**07**

	(b)	An angle ISA 150 X 120 X 10 mm is carrying a tensile load of 350 kN. It is connected to a 10 mm thick gusset plate by 8 mm fillet weld at the sides and end of longer leg. Design the weld joint, allowable shear stress for the weld is 110 N/mm^2.	**07**
Q.5	**(a)**	Design a slab base for a column ISHB 400 @82.2 kg/m carrying a total load of 1000 kN. Take bearing strength of concrete as 3.5 N/mm^2.	**07**
	(b)	Explain clearly the difference between flexural bond and development bond. What is the development length of a 20 mm ϕ steel grade fe415 bar used in compression for concrete grade M25?	**07**

OR

Q.5	**(a)**	A steel column is having unsupported length of 4.0 m and is carrying a load of 1200 kN. Design the most economical ISHB section to take this load. The grade of steel is Fe250.	**07**
	(b)	A reinforced concrete column 350mm x 550 mm is loaded with 1200 kN characteristic load .The Bearing pressure on soil is 170 kN $/m^2$ at 1.35 m depth. Determine the dimensions of the footing if the footing is square or the footing is rectangular and Sketch them.	**07**

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