Seat No: _____ Enrollment No : _____

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. Sem. – IV - Examination –June- 2011

Subject Code: 141301

Subject Name: Design of Environmental Structure

Date:06/06/2011 **Time: 10.30 am – 01.00 pm**

Total Marks: 70

Instructions:

1. Use of IS-456, IS-800, IS-875: Part-I, II, III, is permitted.
2. For analysis and design purpose, take concrete grade: M20, steel grade: Fe415 in **RCC design** and yield stress of steel : f_y = 250 MPa in **steel design** as default.
3. Take shear stress in fillet weld as 108 MPa, wherever necessary.
4. Figures to the right indicate full marks to the question.
5. Assume suitable data, if necessary and mention the assumed data clearly in your answers.

Q.1 **(a)** Design a double equal angle tie member connected on same side of gusset plate 6 mm thick connected by 20 mmΦ pds rivets. Members are also connected by tacking rivets. The axial load acting on the member is 400 kN. **07**

(b) Design a riveted connection for the member subjected to an axial force of 225 kN. Member comprises of 2 ISA 90x90x6 mm connected on both sides of the gusset plate. Use 20 mmΦ pds rivets. **07**

Q.2 **(a)** Design a singly reinforced rectangular concrete beam with a clear span 4m supported on 230mm wall. Consider the working live load as 6kN/m and sketch the reinforcement details. **07**

(b) Find the uniformly distributed ultimate load on the beam of rectangular section 300 mm wide and 600 mm deep reinforced by 4 bars of 20mm at an effective depth of 550mm.The effective span of the beam is 6m. **07**

OR

(b) Answer in brief: **07**

(i)Enlist the type of loads that are considered in the design of environmental structures.

(ii)State the difference in design concept between working stress method and limit state method.

(iii) Discuss the merits and demerits of Prestressed concrete

Q.3 **(a)** Design an I-section for a column subjected to axial compression of 1200 kN. The unsupported length of column is 5.5 m with both ends fixed. **07**

(b) Design a slab base foundation for the column section ISHB300 @ 58.8 kg/m subjected to axial force of 1200 kN. Use permissible bearing stress in concrete as 5 N/mm² and safe bearing capacity of soil as 180kN/m². **07**

OR

Q.3 **(a)** Design a simply supported steel beam section subjected to uniformly distributed load of 60 kN/m on the entire span of 5 m. Also check the beam for shear and deflection. **07**

(b) Draw a neat sketch of beam to beam stiffened seated connection. **07**

Q.4 **(a)** Design a simply supported RCC slab for an office floor having clear dimensions of 3m x 7.5m with 230mm walls all around. **07**

(b) Explain clearly the difference between flexural bond and development bond. What is the development length of a 20 mm diameter of steel bar of grade Fe415 used in compression for concrete grade M_{25}? **07**

OR

Q.4	**(a)**	Determine the depth of neutral axis for a 200mmx500mm section reinforced with 1% steel at an effective cover of 50mm if the grades are (i)M20 and Fe500 and (ii)M25 and Fe415 What are the measures specified to prevent brittle failure of the beam in flexure?	**07**
	(b)	Design and detail the shear reinforcement for a RCC beam, having cross section 250 mm wide x 600 mm effective depth, subjected to 300kN factored shear. The beam is reinforced with 1.1% tension steel.	**07**
Q.5	**(a)**	Design the reinforcements in a circular column of diameter 400mm with helical reinforcement to support a factored load of 1500 kN. The column has an unsupported length of 3.4m and is braced against side sway. Adopt M25 and Fe415.	**07**
	(b)	A reinforced concrete column 300mm x 600mm is loaded with 1200 kN characteristic load .The Bearing pressure on soil is 180 kN /m^2 at 1.35 m depth. Determine the dimensions of the footing and sketch them if (i)the footing is square (ii)the footing is rectangular	**07**

OR

Q.5		Design a built-up column carrying an axial load of 1200 kN. Its length is 8 m and it is effectively held in position at both ends and restrained against rotation at one end. Assume a yield stress of 250 MPa. Also design single Lacing system or Battening system for this column.	**14**

****