

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- IV<sup>th</sup> SEMESTER-EXAMINATION – MAY/JUNE- 2012****Subject code: 141301****Date: 23/05/2012****Subject Name: Design of Environmental Structures****Time: 10:30 am – 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary and mention it clearly.
3. Figures to the right indicate full marks.
4. Use of IS-456, IS-800, IS-875 (Part I, II, III) SP-6, Steel Table is permitted

<b>Q.1</b>	<b>(a)</b>	Design a singly reinforced rectangular beam for a moment of 80 kNm. The width of the beam is limited to 200mm. Use M <sub>20</sub> grade of concrete and Fe415 grade of steel.	<b>07</b>
	<b>(b)</b>	Calculate the ultimate moment carrying capacity of a rectangular RCC beam of width 250mm and effective depth 450mm. The beam is reinforced with 5 bars of 20mm diameter Fe 415 grade steel. The grade of concrete is M <sub>30</sub> .	<b>07</b>
<b>Q.2</b>	<b>(a)</b>	Determine the tension and compression reinforcement required for a RCC beam of width 300mm and overall depth 600 mm to carry a factored moment of 350kNm. The grade of concrete M <sub>20</sub> and grade of steel Fe415 is used.	<b>07</b>
	<b>(b)</b>	Write short notes on Live load on roofs, Erection loads, Mild steel bars, HYSD bars, TMT bars, Corrosion resistant steel, Coated steel reinforcement.	<b>07</b>
		<b>OR</b>	
	<b>(b)</b>	What is pre-stressing? Explain pre-tensioning and post-tensioning. Also give examples of structural elements where these methods are suitable.	<b>07</b>
<b>Q.3</b>	<b>(a)</b>	The tie of a roof truss carries an axial tension of 200kN. Design the section of the member and also the connection of the member to 10 mm thick gusset plate. Use 20 mm diameter rivets.	<b>07</b>
	<b>(b)</b>	An angle ISA 150X115 X 8 mm is carrying a tensile load of 300 kN. It is connected to a 10 mm thick gusset plate by 6 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 <sup>2</sup> .	<b>07</b>
		<b>OR</b>	
<b>Q.3</b>	<b>(a)</b>	A steel column is having unsupported length of 4.25 m and is carrying a load of 1000 kN. Design the most economical ISHB section to take this load. The grade of steel is Fe250.	<b>07</b>
	<b>(b)</b>	Sketch the sectional plan, elevation and side view of (i) column to beam and (ii) beam to beam framed connection	<b>07</b>
<b>Q.4</b>	<b>(a)</b>	Design a short axially loaded square RCC column of size 500 mm for a service load of 2100 kN. The grades of concrete and steel are M <sub>20</sub> and Fe415 respectively. The effective length of the column is 2.5 m.	<b>07</b>
	<b>(b)</b>	Design a simply supported slab resting on 230 mm thick masonry walls. The clear span is 3 m and live load on slab is 3.5kN/m <sup>2</sup> . The grade of concrete and steel is M <sub>20</sub> and Fe415 respectively. Check the slab for deflection.	<b>07</b>

		<b>OR</b>	
<b>Q.4</b>	<b>(a)</b>	A simply supported RCC beam of width 250 mm and effective depth 500 mm is reinforced with 4 bars of 20 mm diameter as tension steel. If the beam is subjected to a factored shear force of 200 kN at the support. Design the shear reinforcement consisting of stirrups and bent up bars. The grade of tension reinforcement and stirrups is Fe250.	<b>07</b>
	<b>(b)</b>	Design an isolated footing of uniform thickness for a RCC column carrying a load of 650 kN. The size of the column is 500 mm X 500 mm. The safe bearing capacity of the soil is 130 kN/m <sup>2</sup> . The grade of concrete is M <sub>20</sub> and the grade of steel is Fe415.	<b>07</b>
<b>Q.5</b>	<b>(a)</b>	Design a slab base for a column ISHB 400 @82.2 kg/m carrying a total load of 1200 kN. Take bearing strength of concrete as 4 N/mm <sup>2</sup> .	<b>07</b>
	<b>(b)</b>	Design a simply supported steel beam of span 6 m to carry a udl of 50 kN/m on entire length and a point load of 80kN at centre. Check the beam for shear and deflection.	<b>07</b>
		<b>OR</b>	
<b>Q.5</b>	<b>(a)</b>	Design Built up column made of two channel section placed back to back to carry an axial load of 1250 kN. The effective length of the column is 6.3m. The grade of steel is Fe 250.	<b>07</b>
	<b>(b)</b>	Design the single lacing system for the above column. Use 20 mm diameter pds rivets for connection.	<b>07</b>

\*\*\*\*\*