Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV • EXAMINATION – SUMMER 2013

Subject Code: 141301 **Date: 07-06-2013**

Subject Name: Design of Environmental Structure

Time: 10:30am – 01:00pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **IS 456, IS 800 and Steel Table are permitted**
5. **Draw neat and clean sketches with pencil only wherever required.**
6. **Use M20 grade of concrete and Fe 415 grade of steel for RCC structure until otherwise stated.**

Q.1 **(a)** A singly RC beam of size 230 x 460 mm (eff. Depth) is reinforced with 3 – 20 mm diameter bars. Find factored moment of resistance of the section. Also find factored moment of resistance if reinforced with 5 – 20 mm diameter bars. **07**

(b) Design a single angle tension member. It is 4 m long and is subjected to 25000 kg load. It is connected to a gusset plate through one leg only. Assume rivet diameter = 18 mm and allowable tensile stress = 1500 kg/cm^2. **07**

Q.2 **(a)** Differentiate Working stress method of design and Limit state method of design with their advantages and limitations. **07**

(b) Why steel used as reinforcement? Enlist the types of reinforcements available in the market and explain them in short. **07**

OR

(b) Classify the various loads acting on structures and elaborate any one of them. **07**

Q.3 **(a)** A simply supported beam of 4.5 m clear span is loaded with factored load of 60 kN/m. It is reinforced with 4 – 20 mm diameter bars at supports. The section of beam is 230 x 560 mm (eff. Depth). Design the shear reinforcement at support. Use M20 – Fe415. **10**

(b) Explain under-reinforced and over-reinforced design. Why the over-reinforced design is not preferred? **04**

OR

Q.3 **(a)** A short RCC column is to carry a factored load of 1900 kN. If the column is to be square, design the column. Assume $e_{min} < 0.05D$. Use M20 – Fe250. **10**

(b) What are the kinds of reinforcement used in slab? What are the functions of distribution bars in slabs? **04**

Q.4 **(a)** Find the allowable load for compression member consisting of two angles ISA 110 x 110 x 12 back to back with a 18 mm gusset plate between them. The member is 4 m long and the end connection is as given: (a) more than two high strength bolts, (b) welded (c) the member is continuous over several points. **14**

OR

Q.4 **(a)** Elaborate the design steps for lacing system used in built up compression member. **07**

(b) Draw stiffened and unstiffened connections and explain them. **07**

Q.5 A simply supported one way slab of effective span 4 m supported on masonry walls of 230 mm thickness. Design the slab. Assume live load = 2.5 kN/mm^2 and floor finish = 1 kN/mm^2. Carry out all necessary checks and draw necessary reinforcement diagram. **14**

OR

Q.5 A built up steel column comprising two ISWB 400 RSJ sections with their webs spaced at 325 mm and connected by 10 mm thick battens, transmits an axial load of 2000 kN. SBC of soil at site = 300 kN/m^2. The safe permissible stress on concrete bed = 4 N/mm^2. Design a suitable foundation for column adopting a slab base. **14**

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