Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV • EXAMINATION – WINTER 2013

Subject Code: 141301 Date: 19-12-2013

Subject Name: Design of Environmental Structure

Time: 02.30 pm - 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. **For analysis and design purpose, take concrete grade M20, steel grade Fe415 in RCC design and yield stress of steel 250Mpa in steel design if not given in the data.**
5. **Use of IS456, IS800, IS875: Part I, II, III, SP-6 and SP 16 are permitted.**
6. **Take shear stress in fillet weld as 108 Mpa, wherever necessary.**

Q.1 **(a)** A reinforced concrete beam is supported on two walls of width 500 mm. the distance between both supports is 5 m. the beam is loaded with a live load of 16 kN/m. adopt grade of concrete M20 and grade of steel Fe415. Take the width of beam as half of overall depth. Calculate tension reinforcement and check for deflaction. **07**

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

Q.2 **(a)** Determine the efficiency of lap joint for 8 mm thick plates joined with 16 mm diameter power driven shop rivets at a pitch of 50 mm c/c. **07**

(b) A tension member of roof truss carries an axial tension of 210 kN. design the section composed of two unequal ISA placed on either side of 10 mm thick gusset plate. Take diameter of rivet 20 mm pds and grade of steel Fe250. Also find number of rivets required. **07**

OR

(b) Explain under-reinforced and over-reinforced design. Why the over-reinforced design is not preferred? **07**

Q.3 **(a)** Design ISHB section for a column taking compressive force of 1200 kN. The unsupported length of column is 5 m with both ends fixed. **07**

(b) Design a slab base for a steel column ISHB 350 weighing 67.4 kg/m carrying a total load of 1400 kN. Take the bearing strength of concrete as 4 MPa. **07**

OR

Q.3 **(a)** Design a simply supported steel beam of 6.5 m to carry a udl of 52 kN/m on entire span. Check for shear and deflaction. **07**

(b) A tie in a truss consists of a pair of angles ISA 90 X 60 X 10 mm welded on wider side of gusset plate 12 mm thick through the longer legs. Design the welded joint if the angles subjected to a tensile force of 420 kN. **07**

Q.4 **(a)** Determine the tension and compression reinforcement required for a RCC beam of width 300 mm and 550 mm overall depth to carry a factored moment of 300 kNm. Use M20 – Fe415. **07**

(b) Design a simply supported slab resting on 300 mm thick wall. The clear span is 3.2 m and imposed load on slab is 3 kN/m^2. Also, check the slab for deflaction. Use M20 – Fe415. **07**

OR

Q.4 **(a)** A simply supported beam 300 X 600 mm effective depth carries a udl of 68 kN/m including self weight over a clear span of 6.5 m. The beam is reinforced with 5 bars of 25 mm diameter from which 2 bars are taken as a bent up at 45^0 from a distance of L/7 from the face of support. Design the shear reinforcement. Use M20 – Fe 415. **07**

(b) A RCC beam rectangular in section 300 mm wide and 500 mm effective depth is reinforced with 4 bars of 20 mm diameter. Determine the moment of resistance of the section. Use M20 and Fe415. **07**

Q.5 **(a)** Design the reinforcement in a column of size 400 X 600 mm a factored load of 3000 kN. the columns has an unsupported length of 3 m. Use M20 – Fe415. **07**

(b) Elaborate the design steps for battening system used in built up compression member. **07**

OR

Q.5 **(a)** A RC column 400 X 400 mm supports an axial working load of 1000 kN. The safe bearing capacity is 200 kN/m^2. Design the square pad footing for given column. Use M20 – Fe415. **07**

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

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