

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**B. E. - SEMESTER – IV • EXAMINATION – WINTER 2012**

**Subject code: 141301****Date: 27/12/2012****Subject Name: Design of Environment structure****Time: 02.30 pm - 05.00 pm****Total Marks: 70****Instructions:**

1. Use of IS-456, IS-800, IS-875: Part-I, II, III, SP-6 & SP-16 is permitted.
2. For analysis and design purpose, take concrete grade:  $M_{20}$ , 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.
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 simply supported singly reinforced beam subjected by a factored moment of 200 kNm. Width of the beam is 300 mm. Use M20 and Fe415 grades. 07
- (b) Find the effective length of the beam of rectangular section 230mm wide and 550 mm deep reinforced by 4 bars of 20mm at an effective depth of 500mm. The beam is subjected by a udl of 50 kN/m on entire span. 07
- Q.2 (a) Design a double equal angle tie member connected on either side of gusset plate 6 mm thick connected by 20 mm  $\Phi$  pds rivets. Members are also connected by tacking rivets. The axial load acting on the member is 320 kN. 07
- (b) Design riveted connection for the member subjected by the axial force of 250 kN. Member comprising of 2 ISA 100x100x8 mm connected on both side of gusset plate. Use 16 mm  $\Phi$  pds rivets. 07
- OR**
- Q.3 (b) Design welded connection for the above example Q.2 (b) 07
- (a) Design an ISHB section for a column taking compressive force of 900 kN. The unsupported length of column is 5.5 m with both end fixed. 07
- (b) Design a slab base foundation for the column section ISHB300 @ 58.8 kg/m subjected by axial force of 1000 kN. Use permissible bearing stress in concrete as 5 N/mm<sup>2</sup> and Safe bearing capacity of soil as 180 kN/m<sup>2</sup>. 07
- OR**
- Q.3 (a) Design a simply supported beam (steel) section subjected by a udl of 60 kN/m on entire span of 6 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 shear reinforcement for an RCC beam, having cross section 250 mm wide x 500 mm effective depth, subjected to factored shear force of 250kN. The beam is reinforced with 1% tension steel. Use bent up bar along with 2 legged 6mm dia vertical stirrups. 07
- (b) Design a one way slab for the simply supported span of 3.0 m resting on 230 mm wide beam. Use M20 and Fe415 grade. Slab is used for commercial purpose. 07
- OR**
- Q.4 (a) A RCC column of c/s 300 mm x 450 mm having 4-25 mm dia as longitudinal reinforcement and having 2 legged 6 mm dia lateral ties at a pitch of 250 mm c/c. Check that reinforcement provided is confirms the IS or not. If not give your suggestion. 07
- (b) Calculate reinforcement for doubly reinforced beam section of 250 x 500 mm effective subjected by a moment of 340 kNm. Use M20 and Fe415 grades. 07

- Q.5 (a) Design the reinforcements in a circular column of diameter 450mm with lateral ties to support axial load of 900 kN. The column has an unsupported length of 3.4m. Adopt M25 and Fe-415 . 07
- (b) A reinforced concrete column 400mm x 400 mm is loaded with 1100 kN characteristic load .The Bearing pressure on soil is  $160 \text{ kN /m}^2$  at 1.5 m depth . Determine the dimensions of the square footing and Sketch them. 07
- OR**
- Q.5 (a) Design a built-up column carrying an axial load of 1300 kN. Its length is 7.2 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

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