

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-IV Examination-Nov/Dec-2011****Subject code: 141301****Date: 25/11/2011****Subject Name: Design of Environmental Structure****Time: 02.30 pm -5.00 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: M_{20} , steel grade: Fe_{415} 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.
Attempt all questions.
 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 singly reinforced rectangular concrete beam with effective span 3.2m supported on 230mm wall. Take working live load of 6.5 kN/m and sketch the reinforcement details. 07

(b) Find the uniformly distributed ultimate load on the beam of rectangular section 230mm wide and 550 mm deep reinforced by 4 bars of 20mm at an effective depth of 500mm. The effective span of the beam is 5m. 07

Q.2 (a) Design a double unequal angle tie member connected on same side of gusset plate 6 mm thick connected by 20 mm Φ pds rivets. Members are also connected by tacking rivets. The axial load acting on the member is 350 kN. 07

(b) Design riveted connection for the member subjected by the axial force of 225 kN. Member comprising of 2 ISA 100x100x8 mm connected on both side of gusset plate. Use 20 mm Φ pds rivets. 07

OR

(b) Design welded connection for the above example Q.2 (b) 07

Q.3 (a) Design an I-section for a column subjected by axial compression of 1000 kN. The unsupported length of column is 5 m with one end fixed and other hinged. 07

(b) Design a slab base foundation for the column section ISHB300 @ 58.8 kg/m subjected by axial force of 1100 kN. Use permissible bearing stress in concrete as 4 N/mm² and Safe bearing capacity of soil as 150 kN/m². 07

OR

Q.3 (a) Design a simply supported beam (steel) section subjected by a udl of 50 kN/m on entire span of 5 m with a central point load of 100 kN. Also check the beam for shear and deflection. 07

(b) Draw a neat sketch of beam to beam unstiffened 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 shear force of 250kN. The beam is reinforced with 1% tension steel. 07

(b) Explain clearly the difference between flexural bond and development bond. What is the development length of a 16 mm ϕ steel grade fe_{415} bar used in compression for concrete grade M_{20} ? 07

OR

- Q.4 (a) Design the reinforcements in a column of size 230mmx450mm to support an axial load of 1000 kN. The column has an unsupported length of 3 m and is braced against side sway. Adopt M20 and Fe-415 07
- (b) Calculate reinforcement for doubly reinforced beam section of 230 x 500 mm effective subjected by a moment of 350 kNm. Use M20 and Fe415 grades. 07
- Q.5 (a) Design the reinforcements in a circular column of diameter 450mm with helical reinforcement to support axial load of 900 kN. The column has an unsupported length of 3.4m and is braced against side sway. Adopt M25 and Fe-415 . 07
- (b) A reinforced concrete column 300mm x 450 mm is loaded with 1000 kN characteristic load .The Bearing pressure on soil is 180 kN /m² at 1.35 m depth . Determine the dimensions of the footing if the footing is square or the footing is rectangular and Sketch them 07

OR

- Q.5 (a) Design a built-up column carrying an axial load of 1400 kN. Its length is 7 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

