

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII EXAMINATION – SUMMER 2016****Subject Code:170603****Date:10/05/2016****Subject Name:Structural Design-I****Time:02:30 PM to 05:30 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. USE OF IS:456:2000,IS:800:2007,SP-16 AND STEEL TABLE IS PERMITTED

- Q.1** (a) Explain design philosophy and role of a structural engineer in the design of a structure. 07
- (b) Define: i) welding ii) effective throat thickness iii) size of the weld 07
iv) pitch v) edge distance vi) gauge distance vii) short column
- Q.2** (a) State and explain modes of failure of beam in flexure. 07
- (b) Design a singly reinforced beam subjected to factored moment of 250 KN-m. Assume width of the beam 250 mm. Use M20 and Fe415. 07
- OR**
- (b) A flanged beam of size 300 mm x 500 mm effective depth to resist a bending moment of 350 KN-m. Flange width is 1500 mm and depth of the flange is 100 mm. Design the reinforcement for flexure only. Use M20 & Fe415. 07
- Q.3** (a) Design a simply supported RCC slab having clear span 4 m x 4 m rested on the 230 mm thick brick wall, subjected to live load of 3 KN/m² and floor finish 1 KN/m² for the corners held down condition. Provide detailed sketches. Checks are not required. Use M20 and Fe415. 07
- (b) Design a tension member to carry a factored tensile load of 300 KN. Assume single row of M24 bolts grade 4.6 and grade of steel Fe 410. Provide all necessary checks. 07
- OR**
- Q.3** (a) Design a short circular column with helical reinforcement column square to resist a factored axial load of 2400 KN. Provide all necessary checks and detailed sketch. Use M25 and Fe 415. 07
- (b) Design a suitable RCC footing for the circular column mentioned in Q.3 (a). Use M30 & Fe415. Provide reinforcement details with sketches. 07
- Q.4** (a) A built up column 2 ISMC- 350 at back to back spacing 220 mm is carrying an axial load of 1050 KN. Length of column is 10 m. it is held in position at both the ends but not restrained in direction. Design suitable double lacing system. 07
- (b) A beam ISMB 400 is connected to the flange of a column ISHB 300. the beam is transferring a factored end reaction of 250 KN and factored moment of 25 KN-m. Design a suitable welded connection with fillet weld on both the sides and at the top and bottom of the beam. 07
- OR**
- Q.4** (a) Calculate the compressive strength of a compound column consist of ISHB 450 with one cover plate of 250 x 20 mm on each flange and having length of 3.5 m. assume that the bottom of column is fixed and top is pinned. Grade of steel Fe410. 07

- (b) Design a slab base foundation for a column ISHB 450 to carry a factored axial load of 1400 KN. Safe bearing capacity of soil 250 KN/m^2 . Assume Grade of steel Fe 410 and concrete M30. Provide detailed sketches. 07

Q.5 (a) Calculate the moment carrying capacity of a 3.5 m long ISMB 450 beam which has full torsional restraint and no warping restraint at ends. 07

- (b) Calculate the shape factor for a thin hollow circular section of internal diameter d and external diameter D . 07

OR

Q.5 (a) i) Why should plastic or compact section be preferred for beam section in the Limit state of design method? 02

ii) Why are end returns provided in fillet welds? 02

iii) Explain in brief: inelastic buckling. 03

- (b) Explain in detail: direct design method for the flat slabs. 07
