GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VII • EXAMINATION – WINTER-2017

Subject Code:170603   **Date: 10-11-2017**
Subject Name: Structural Design -I
Time: 10:30 am to 01:30 pm   **Total Marks: 70**
Instructions:
1. Use of SP-16(Design Aids) is NOT permitted.
2. Use of IS- 456-2000, IS: 800-2007 and Steel Table is permitted.
3. Attempt all questions.
4. Make suitable assumptions wherever necessary.
5. Figures to the right indicate full marks.

Q.1	**(a)**	State advantages and disadvantages of Welded and bolted connections.	**07**
	(b)	Explain in brief: Lug Angle.	**04**
	(c)	Describe what you understand by class 4.6 and class 8.8 bolts.	**03**
Q.2	**(a)**	A column of height 5 m is hinged at the ends. It is square in cross- section of side 360 mm and consists of 4 angles of ISA 80 X 80 X10 mm at each corner, suitably laced. Find load carrying capacity of column.	**07**
	(b)	Derive the expression for depth of neutral axial and moment of resistance for a balanced RCC beam section.	**07**
		OR	
	(b)	Draw neat and clean figures for beam to beam connection and beam to column connection in steel design.	**07**
Q.3	**(a)**	A simply supported R.C.C. beam of size 230 mm wide and 450mm depth with clear span of 5 m is reinforced with 4 nos. of 16 mm diameter bar and clear cover of 25 mm. Width of support is 230 mm. It is loaded by uniformly distributed load of 50 kN/m. Design the Shear Reinforcement using 2 legged 6 mm mild steel stirrups. Use M20 grade concrete and Fe-415 grade steel.	**07**
	(b)	Design a slab of size 3.5 m x 7.5 m resting on wall of 230 mm thick. Assume Live load = 3 kN/m^2. Check for cracking and deflection only. Use M20 grade concrete and Fe-415 grade steel.	**07**
		OR	
Q.3		An RCC column of size 350 mm x 350 mm reinforced with 8 nos of 16 mm diameter bars, carries characteristic load of 900 kN. The allowable bearing pressure on soil is 210 kN/m^2. Design isolated footing. Use M20 and Fe 415 for both column and footing. Carry out all checks. Draw detailed reinforcement layout also. Assume 10% dead load of footing.	**14**
Q.4	**(a)**	A 150 mm thick R. C. C. flat slab is loaded by live load of 5 kN/m^2 and floor finish load of 1.5 kN/m^2. It is supported by 4 columns of size 450 x 450 mm. The column head is changing the size of 600 x 600 mm bottom to 1500 x 1500 mm at top over the depth 500 mm. The columns are placed at 4.5m x 6m centre to centre. Check the slab for shear only.	**07**
	(b)	An angle section 90 x 90 x 8 mm is to be connected to gusset plate by 6 mm fillet weld on sides and at the end of the member. The member is carrying tensile load of 120 kN. Design the welded connection. Assume steel grade Fe 410 and field welding.	**07**

Q.4 **(a)** Design a short column square in section to resist the factored axial load of 2400 kN. Provide all necessary checks and detailed sketch. Use M25 grade of concrete and Fe 415 grade of steel. **07**

(b) An unequal angle 1.5 m long, of a truss is connected to the gusset plate. It carries ultimate tension of 230 kN. Design the section using 4 mm weld. **07**

Q.5 Design a simply supported steel beam of 7 m span carrying a RC floor capable of providing lateral restraint to the top compression flange. The total factored U.D.L subjected on beam is 50 kN/m throughout and factored point load acting at center is 200 kN. Use ISMB section. Check for web buckling only. **14**

OR

Q.5 **(a)** A steel column ISMB600 is loaded by the factored axial compressive load of 600 kN. Design the suitable slab base for the column. Assume Fe 410 grade steel and M25 grade concrete. Take safe bearing capacity of soil as 200 kN/m^2. **07**

(b) Design a laterally unrestrained beam simply supported over a span of 2 m. It carries a uniformly distributed load of 56 kN/m including self weight. Use ISMB section. **07**

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