

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2017

Subject Code: 2160607

Date: 20/11/2017

Subject Name: Elementary Structural Design

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, IS:800 and steel table is permitted.
5. Assume M20 grade concrete and Fe415 steel for RCC element and Yield stress of 250 MPa for the structural steel if not given.

		MARKS
Q.1	(a) Discuss the salient features of working stress method and limit load method	03
	(b) Explain the terms: 1. Partial safety factor 2. Limit state	04
	(c) State advantages and disadvantages of welded and bolted connections	07
Q.2	(a) Write the advantages and disadvantages of structural steel	03
	(b) State and explain in brief types of limit states	04
	(c) Find the moment of resistance of a singly reinforced concrete beam 230mm width and 410mm effective depth, reinforced with 4 bars of 16mm diameters of Fe415 and M20 concrete.	07
	OR	
	(c) A simply supported RCC beam 230mm wide, 410mm effective depth is subjected to ultimate shear force of 200kN at supports. Tensile reinforcement at supports of 0.5%. Design shear stirrups near support and also design nominal shear reinforcement at mid span for M20 concrete and Fe 250 steel for stirrups.	07
Q.3	(a) Derive equation for depth of neutral axis and moment of resistance for a balance beam section	03
	(b) Design a short rectangular RCC column to carry an axis load of 1200 kN. Use M25 grade concrete and Fe415 grade steel.	04
	(c) Design a RCC slab continuous over all four sides having span of 3.5m X 4.5m subjected to live load of 3kN/m ² and floor finish 1.3 kN/m ² . Use M20 and Fe415	07
	OR	
Q.3	(a) Sketch neatly the design stress and strain block parameters	03
	(b) Design isolated footing for an axially loaded column 350 X 350 mm in cross section and carrying 1600 kN working load. Take SBC of soil as 250 kN/m ²	04
	(c) Design a simply supported one way RCC slab with clear span of 3m X 7m. Assume the live load as 3kN/m ² and floor finish 1kN/m ² .	07

- Q.4** (a) Describe the different types of welded connections. **03**
(b) Design a fillet weld to connect ISA 65 X 45 X 8 mm with 12 mm thick gusset plate. The member carries a tensile load of 100 kN. **04**
(c) Design a tension member to carry a factored load of 300kN. Use single unequal angle with 4mm fillet weld for the connection to gusset plate. Length of member is 3.5m. Take f_y 250 MPa and f_u 410 MPa **07**

OR

- Q.4** (a) Draw the neat sketch of lacing systems. **03**
(b) Design a lap joint to connect two plates 300mm wide and 16mm thick using 20mm diameter bolts of grade 4.6. The applied load is 375 kN. **04**
(c) Design a simply supported steel beam of 4.5m effective span to carry 15 kN/m working dead load and 10 kN/m working live load. Compression flanges are restrained laterally throughout the span. **07**
- Q.5** (a) Write the importance of lacing and battening **03**
(b) Sketch the details of gusseted base footing. **04**
(c) Design a single angle discontinuous strut to carry a factored axial compressive load of 65 kN. The length of strut is 3.0m between intersections. It is connected to 12mm thick gusset plate by 20mm diameter 4.6 grade bolts. Use steel of grade Fe 410 **07**

OR

- Q.5** (a) Write the characteristics of Plastic, Compact and Slender sections **03**
(b) Sketch the typical fillet and butt welded connection **04**
(c) A built up column with 2 ISMC 300, back to back at spacing of 150mm, is carrying an axial load of 800 kN. Length of the column is 8m. It is held in position at both ends but not restrained in direction. Design a suitable double lacing system. **07**
