

Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering - SEMESTER - VI EXAMINATION - WINTER 2025

Subject Code: 2160607

Date: 25-11-2025

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. Simple and non-programmable scientific calculators are allowed.**

	Marks
Q.1 (a) Explain the concept of limit state design methodology.	03
(b) Write advantages and disadvantages of steel and R.C.C. structures.	04
(c) A singly RC beam has effective dimension of 250 mm x 450 mm. It is reinforced with 3 nos -20 mm dia. of Fe 415. Find out moment of resistance of beam. Use M 20.	07
Q.2 (a) Explain different modes of failure for R.C.C beam in flexure.	03
(b) Write design steps for isolated rectangular column footing.	04
(c) Design the slab for the room for office building 3.2 m x 9.2 m. The slab is resting on 300 mm thick wall and resisting live load of 2.5 kN/m ² . Use M-20 and Fe-415. Check the slab for deflection and cracking.	07
OR	
(c) Design a simply supported two-way slab of 3 m x 4 m clear span supported on 300 mm thick walls on all the four sides. Assume live load 4 kN/m ² and floor finish 0.5 kN/m ² . Use M-20 and Fe-250. Corners are not held down. Draw cross section of slab along both directions.	07
Q.3 (a) Explain the importance of shear reinforcement in RCC Members.	03
(b) Define a one-way simply supported slab and explain when it is preferable to use this type of slab in structural design.	04
(c) Design a square footing for an isolated column 500 mm x 500 mm size carrying an axial load of 1600 kN. Safe bearing capacity of soil is 200 kN/m ² . Use M-20 and Fe-415. Draw neat sketch.	07
OR	
(a) What are the reasons for providing combined footing.	03
(b) Write provisions of IS 456:2000 for [a] Min & Max percentage of steel in column [b] Min area of steel in slab.	04

- (c) A single unequal angle 100 x 75 x 6 mm is connected to a 10 mm thick gusset plate at the ends with six 16 mm dia. Bolts to transfer tension. Determine the design tensile strength of the angle assuming that the yield and ultimate stress of steel used are 250 MPa and 410 MPa. Assume that the longer leg is connected to the gusset plate. Also calculate efficiency of the member. **07**

- Q.4** (a) What is difference between bending and buckling occur? **03**
- (b) Write short note on “Lug Angle”. **04**
- (c) A built-up column 2ISMC-350 at back-to-back spacing 220 mm is carrying an axial load of 1100 kN. Length of column is 10 m. It is held in position at both ends but not restrained in direction. Design suitable double lacing system. **07**

OR

- (a) Explain the various notation of welding. **03**
- (b) Describe the different types of connections. **04**
- (c) Design a slab base foundation for a column ISHB 350 to carry a factored axial load of 1200 kN. Assume Fe 410 grade steel and M 25 concrete. Take safe bearing capacity of soil as 200 kN/m². **07**

- Q.5** (a) List the different modes of failure of tension member. **03**
- (b) Explain single lacing system and double lacing system with neat sketches. **04**
- (c) Design a simply supported Steel beam of span 6 m carrying working loads of DL = 15 kN/m and LL = 10 kN/m. Assume that the compression flange of the beam is Laterally restrained throughout. **07**

OR

- (a) Write the characteristics of Plastic, Compact and Slender sections. **03**
- (b) Explain with sketches ‘Block shear failure’. **04**
- (c) Laterally unrestrained beam of 3 m long ISMB 350 beam which has full torsional restraint and no warping restraint at ends only. Calculate the moment carrying capacity of a beam. **07**
