Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2023

Subject Code:3150612 Date:11-12-2023

Subject Name: Design of Structures

Time:10:30 AM TO 01:00 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.**
5. **Use of IS:456(2000), IS:800 (2007) and Steel table is permitted.**
6. **Assume M20 grade concrete and Fe415 steel for RCC element, if not provided.**

			MARKS
Q.1	**(a)**	Define the following terms: Clear Cover, Effective Cover and Partial Safety Factor.	**03**
	(b)	Discuss the advantages of structural steel.	**04**
	(c)	Explain briefly about Under reinforced section, Balanced section and Over reinforced section.	**07**
Q.2	**(a)**	Discuss the assumptions made in the limit state design of reinforced concrete compression members.	**03**
	(b)	An R. C. C. beam of size 350 wide and 550mm deep is reinforced by tension bars as 5nos. of 25mm dia. and compression bars as 3nos. of 20mm dia. Calculate the moment of resistance of beam if the clear cover is 25mm on both the sides.	**04**
	(c)	Explain one way shear check and two way shear check for footing.	**07**
		OR	
	(c)	Discuss the various philosophies of the design in R. C. C. structures. Also discuss the merits and demerits of each.	**07**
Q.3	**(a)**	Give functions of following (i) Stirrups in a beam (ii) Ties in a column (iii) Distribution reinforcement in a slab	**03**
	(b)	A 4m high column is effectively held in position at both ends and restrained against rotation at one ends. Its Diameter is resisted to 40 cm. Calculate the reinforcement if it is required to carry a factored axial load 1600 kN.	**04**
	(c)	Design an Isolated square footing for square column of 450 mm x 450 mm For axial load of 840 kN. Take SBC of soil 100kN/m^2. Draw all necessary sketches.	**07**
		OR	
Q.3	**(a)**	Sketch the details of slab base footing	**03**
	(b)	Determine Bolt value of 20 mm diameter bolt connecting 10 mm plates in : a) Single Shear and b) Double Shear Grade of bolt is 4.6 & Grade of plate is 410 MPa.	**04**
	(c)	Design a simply supported beam of span 5 m subjected to working dead load of 24kN/m and Live load of 13 kN/m. The beam is laterally unrestrained. Check for deflection is not required	**07**

Q.4	**(a)**	Differentiate between one-way slab and two-way slab.	**03**
	(b)	State the advantage and disadvantage of bolted and welded connections.	**04**
	(c)	An ISA 150x75x10 mm is subjected to axial tensile force of 190 kN connected by its longer leg to 10 mm thick gusset plate. Design welded connection for shop welding.	**07**

OR

Q.4	**(a)**	Explain the lap and butt joint with neat sketches.	**03**
	(b)	Explain with neat sketches about "Lacing" and "Battening"	**04**
	(c)	Design a simply supported one way slab 3m x 7m supported on 300 mm wide beams. The slab carries a 2 kN/m^2 live load and 1.2 kN/m^2 finish load. Check criteria for deflection and development length.	**07**

Q.5	**(a)**	Give Codal provisions for development length, Bond Stress , Anchoring reinforcement.	**03**
	(b)	Explain factors affecting the strength of the tension member.	**04**
	(c)	Determine the design axial compressive load on the given column section ISMB 450 @ 72.4 kg/m having length 4 m between the intersections and pined at the ends. Take fy 250 MPa.	**07**

OR

Q.5	**(a)**	Sketch the typical bolted connection using lug angle.	**03**
	(b)	Sketch reinforcement detail for a simply supported one-way square slab showing all required details including torsion reinforcement.	**04**
	(c)	Design a slab base for a built up column composed of 2 channel sections ISMC 300 placed back to back at clear spacing 200 mm Axial factored load on column is 850 KN and SBC of soil is 175 KN/m^2.	**07**

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