Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (NEW) EXAMINATION – SUMMER 2024

Subject Code:3150612 Date:21-05-2024

Subject Name:Design of Structures

Time:02:30 PM TO 05:00 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, IS 875 and Steel Table is permitted. *SP-16 is not allowed in examination*.**

			MARKS
Q.1	**(a)**	Differentiate the limit state method and working stress method of design for RCC structures.	**03**
	(b)	Derive the limiting values of $X_{u,lim}/d$ for Fe 250 and Fe 415 grade of steel.	**04**
	(c)	Evaluate the moment of resistance of a beam section 230 mm X 460 mm effective depth reinforced with 2 Nos 16 mm diameter bars as compression reinforcement at an effective cover of 40 mm and 4 Nos 20 mm diameter bars as tension reinforcement Use grade M20 and Fe 500.	**07**
Q.2	**(a)**	What does 6 and 8 imply for bolts of grade 6.8?	**03**
	(b)	State and explain in brief types of limit states in the design of steel structures.	**04**
	(c)	Calculate the strength of a 20 mm diameter bolt of grade 4.6 for the Lap joint. The main plates to be jointed are 12 mm thick.	**07**
		OR	
	(c)	Two plates of 16mm and 14mm thickness are to be joined by groove weld. The joint is subjected to a factored tensile force of 430 kN. Due to some reasons the effective length of the weld that could be provided was 175 mm only. Determine the safety of the joint if (a) Single –V groove weld is provided (b) Double-V groove weld is provided.	**07**
Q.3	**(a)**	Differentiate the single and double cover butt joint with neat sketches.	**03**
	(b)	Draw neat sketch of slab base foundation.	**04**
	(c)	Find a suitable angle section to resist a factored tensile force of 200 kN assuming single row of 16 mm bolts. Take yield stress f_y= 250 N/mm^2 and ultimate stress of 410 N/mm^2.	**07**
		OR	
Q.3	**(a)**	Define (i) Factor of Safety (ii) Pitch (iii) slenderness ratio	**03**
	(b)	Compare the stress-strain behavior of concrete and steel with stress block parameters adopted by IS: 456-2000 and IS 800-2007 with neat sketches.	**04**
	(c)	Design an interior slab panel of effective dimensions 4.2 m × 6.25 m subjected to a factored load of 15 kN/m^2 inclusive of self-weight and floor finish load. The slab is provided with main reinforcement bar diameter as 10 mm, and has overall thickness of 150 mm. Clear cover is 20 mm, grade of concrete is M20, grade of steel Fe415.	**07**
Q.4	**(a)**	State advantages and disadvantages of bolted connections.	**03**

	(b)	Determine the development for 12 mm diameter bar, Fe 415 grade steel in compression and M 20 grade of concrete.	**04**
	(c)	Evaluate the value of the least radius of gyration for a compound column consisting of ISHB 250 @ 536.6 N/m with one cover plate 300 mm × 20 mm on each flange.	**07**

OR

Q.4	**(a)**	Draw neat sketch of Single and double lacing system.	**03**
	(b)	Why are the end returns provided in fillet welds?	**04**
	(c)	Explain the design procedure of laterally supported beam.	**07**
Q.5	**(a)**	Define (1) Gauge distance (2) Edge distance (3) End distance	**03**
	(b)	Write the design steps for single lacing system for column.	**04**
	(c)	An I-section beam is fabricated with plates of following dimensions: Flanges: 600 X 20 mm; Web: 1600 X 12 mm. Classify flanges, web and section. Also determine the plastic moment capacity of the beam about its strong axis, if the grade of steel is Fe 410.	**07**

OR

Q.5	**(a)**	Why are four different buckling curves prescribed to evaluate column strength?	**03**
	(b)	Enlist the various failure modes of axially loaded tensile member along with sketch (line diagram only).	**04**
	(c)	Explain the design procedure for lug angle for tension member.	**07**

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