

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2023****Subject Code:3164011****Date:04-07-2023****Subject Name:Design of Concrete and Masonry 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, IS 875, IS1905, IS 2212, IS 4326 is allowed.
6. Draw neat and clean sketches.

		MARKS
Q.1	(a) Explain in brief types of limit states of serviceability.	03
	(b) Explain the terms 'Balanced', 'Over-reinforced' and 'Under-reinforced' sections in bending. Explain which of these should be recommended in design.	04
	(c) Calculate moment carrying capacity of a rectangular beam with 250 mm × 500 mm overall section and having tension reinforcement 5 nos. of 25 mm diameter. Assume effective cover provided is 45 mm at tension side. Adopt M 30 and Fe 415 grade of materials.	07
Q.2	(a) Explain stress strain curve for concrete.	03
	(b) Verify the control of deflection criteria for a simply supported one way slab having thickness of 150 mm and clear span of 3.0 m. Effective cover provided to slab is 25 mm. Slab is reinforced with main reinforcement of 10 mm ϕ @ 125 mm c/c and distribution reinforcement of 8 mm ϕ @ 200 mm c/c. Assume M 25 and Fe 415 grade of materials is used.	04
	(c) Design a reinforced concrete rectangular beam section of size 300 mm × 550 mm overall from architectural considerations. The beam is subjected to design moment of resistance 325 kN.m. The effective cover to reinforcement is taken as 50 mm. Adopt M 25 and Fe 415 grade of materials.	07
	OR	
	(c) Design a cantilever beam of effective span of 1.5 m to sustain the uniformly distributed load of 15 kN/m. Use M 25 and Fe 415 grade of the materials are used.	07
Q.3	(a) Enumerate reasons for providing flanged beam in R.C.C framed structure.	03
	(b) A cantilever beam of span 2.0 m is projected from a column of 600 mm width. The beam is provided with 4 # 20 mm ϕ of Fe 500 grade of steel. Beam is expose to moderate environmental condition. Calculate the anchorage length required. The concrete grade of M 25 is to be used.	04
	(c) Design a simply supported R.C.C. slab for a room of 3.5 m × 6.5 m (inside dimensions) with 300 mm walls all around. Assume a live load of 3 kN/m ² and floor finish load of 0.75 kN/m ² . M 25 and Fe 415 grade of materials are used. (Note: No check for shear is required)	07
	OR	
Q.3	(a) Give IS recommendation for providing minimum reinforcement in column and pedestal.	03
	(b) Write design steps for two-way slab with corners held down.	04

- (c) Design a simply supported beam for shear reinforcement having dimensions of 300×500 mm with an effective cover 50 mm. A beam is subjected to a working load of 30 kN/m. A beam is reinforced with 4 nos. of 16 mm ϕ . Adopt M20 and Fe 415 grade of materials are used. **07**
- Q.4** (a) Explain various criteria of transverse reinforcement provided in columns. **03**
 (b) Enumerate assumptions made in design of compression members. **04**
 (c) Design a dog legged staircase in a residential building with clear dimensions of staircase area as $4150 \text{ mm} \times 9125 \text{ mm}$. Floor to floor height is 3.5 m. Use M 25 grade of concrete and Fe 500 of steel. **07**
 (Take Riser = 175 mm and Tread = 375 mm).
- OR**
- Q.4** (a) Draw neat sketch isolated footing with reinforcement detailing with all suitable dimensions and data. **03**
 (b) A one-meter-wide single flight stair is to be provided for a height of 3.50 m in residential building. Stair is supported at top and bottom risers by beam of 300 mm width. Calculate design load for stair design. **04**
 (c) Design a circular axially loaded R.C. column having effective length is 3.0 m, it carries design axial load of 2100 kN. Use grade of materials are M35 and Fe 415. **07**
- Q.5** (a) Enlist various points to be taken care during execution of masonry wall as per standard specification. **03**
 (b) Differentiate between confined and unconfined brick masonry? **04**
 (c) Design an isolated sloped footing for the square column size 500 mm, reinforced with 6 bars of 20 mm diameter and carrying an axial load of 1500 kN. The bearing capacity of the soil is 240 kN/m^2 . Use of the materials of M25 and Fe 500. Effective cover for bottom steel is 75 mm. **07**
- OR**
- Q.5** (a) Explain the loads acting on masonry structures. **03**
 (b) What are the common defects of workmanship in masonry work? **04**
 (c) Design an exterior wall of workshop building 4.0 m high carrying steel trusses at the top at 3.5 m spacing. The wall is securely tied at the roof and floor level. The loading shall be assumed as follows. **07**
 (i) Concentrated reaction from the roof trusses = 30 kN acting at the Centre of the wall (ii) Roof loading = 10 kN/m (iii) Ignore wind load.
 (iv) Wall thickness is 300 mm and piers of size 400×400 mm is spaced at 3000 mm distance c/c.

[Reference: TABLE F, SP16, PG. 13]

TABLE F STRESS IN COMPRESSION REINFORCEMENT f_{sc}, N/mm² IN DOUBLY REINFORCED BEAMS WITH COLD- WORKED BARS (Clause 2.3.2)				
f_y , N/mm ²	d'/d			
	0.05	0.10	0.15	0.20
415	355	353	342	329
500	424	412	395	370
