

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2023****Subject Code:3164011****Date:02-12-2023****Subject Name: Design of Concrete and Masonry 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, IS 875, IS1905, IS 2212, IS 4326 is allowed.

		MARKS
Q.1	(a) Write advantages and disadvantages of Reinforced Cement Concrete (RCC) construction material.	03
	(b) Differentiate between conventional slab and flat slab.	04
	(c) Design a simply supported RCC slab for a roof of a hall 4 m × 10 m (inside dimensions) with 230 mm walls all around. Assume a live load of 4 kN/m ² and finish load 1 kN/m ² . Use M 25 concrete and Fe 415 steel. (Note: No check for shear is required).	07
Q.2	(a) Explain stress strain curve for concrete.	03
	(b) Distinguish between balanced, over-reinforced and under-reinforced sections in limit state design. Which of these should be recommended in design?	04
	(c) Find the moment of resistance of a singly reinforced concrete beam of 200 mm width and 400 mm effective depth, reinforced with 4 bars of 16 mm diameter of Fe415 steel. Take M20 concrete. Redesign the beam if necessary	07
	OR	
	(c) Design a cantilever beam of effective span of 1.25 m to sustain the uniformly distributed load of 10 kN/m. Use M 25 and Fe 500 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 1.5 m is projected from a column of 750 mm width. The beam is provided with 4 # 16 mm Ø 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 the shear reinforcement for a beam with b = 350 mm, d = 550 mm, V _u = 125 kN, f _{ck} = 25 N/mm ² , f _y = 415 N/mm ² . Percentage of steel used is 1.67 percent.	07
	OR	
Q.3	(a) Define development length and write an expression for development length.	03
	(b) Draw neat sketch of standard detailing of continuous beam.	04
	(c) Design the shear reinforcement for a simply supported RC beam of effective span 5m with width 300 mm and effective depth 500 mm and carrying a superimposed load of 10 kN/m. The beam is reinforced with 3 bars of 20 mm	07

diameter. Use M20 concrete and Fe 415 grade steel.

- Q.4** (a) Explain various criteria of longitudinal reinforcement provided in columns and pedestal. **03**
- (b) Determine the area of longitudinal steel to be provided in a short column of size 600×600 mm subjected to a factored load of 1500 kN. Use M20 concrete and Fe415 steel. **04**
- (c) Design and detail a dog-legged stair for a building in which the vertical distance between the floors is 3.6 m. The stair hall measures 2.5 m × 5 m. The live load may be taken as 2500 N/m². Assume that stair is supported at outer edges. Use M20 concrete and Fe415 steel. **07**

OR

- Q.4** (a) Explain various criteria of lateral ties provided in columns. **03**
- (b) Sketch typical reinforcement detail in tread-riser type stairs. **04**
- (c) Design an isolated pad footing for the rectangular column size 300×750 mm, reinforced with 6 bars of 20 mm diameter and carrying an axial load of 1000 kN. The bearing capacity of the soil is 200 kN/m². Use of the materials of M25 and Fe 500. Effective cover for bottom steel is 75 mm. **07**

- Q.5** (a) Discuss effective height of wall as per IS standard. **03**
- (b) Enumerate various causes for cracks in masonry. **04**
- (c) A solid wall of thickness 150 mm is constructed with solid concrete blocks of unit strength 5 MPa and M2 type mortar. The floor-to-floor height is 3.2 m. The load is acting axially on the wall. Determine permissible compressive stress in masonry. **07**

OR

- Q.5** (a) Discuss the common workmanship errors in masonry construction. **03**
- (b) Enumerates the factors which influence the compressive strength of masonry. **04**
- (c) Design an exterior wall of workshop building 3.5 m high carrying steel trusses at the top at 6 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 = 40 kN acting at the Centre of the wall (ii) Roof loading = 15 kN/m (iii) Ignore wind load.
- (iv) Wall thickness is 300 mm and piers of size 500 × 500 mm is spaced at 3000 mm distance c/c.
