Seat No. _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER VI (NEW SYLLABUS) EXAMINATION - SUMMER- 2018

Subject Code: 2164001 **Date: 28/04/2018**

Subject Name: Design of Concrete Structures

Time: 10:30 am to 1:30 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Use of IS 456 and SP 16 is allowed.**
3. **Make suitable assumptions wherever necessary.**
4. **Draw neat and clean sketches.**
5. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Explain difference between working stress method (WSM) and limit state method (LSM) of structural design philosophy.	**07**
	(b)	Derive the expression for depth of neutral axial and moment of resistance for a balanced RCC beam section.	**07**
Q.2	**(a)**	A singly reinforced beam having an effective span of 4 m and c/s area of 230 mm × 500 mm, is reinforced with 3 nos. of 20 mm diameter HYSD bars with an effective cover 35 mm. Calculate allowable superimposed load on the beam. Use M 25 grade of concrete and Fe 415 grade of steel.	**07**
	(b)	A doubly RC rectangular beam with 230 mm wide and 500 mm effective depth having 2 nos. 16 mm Ø at compression side and 4 nos. 25 mm Ø at tension side. Effective cover at both the side is 50 mm and grade of materials used are f_{ck} = 20 N/mm^2 and f_y = 415 N/mm^2. Find Moment of resistance of the beam section.	**07**
		OR	
	(b)	A simply supported R.C.C. beam of size 230 mm wide and 450 mm depth with clear span of 5 m is reinforced with 4 nos. of 16 mm diameter bar and clear cover of 25 mm. Width of support is 230 mm. It is loaded by uniformly distributed load of 50 kN/m. Design the Shear Reinforcement using 2 legged 8 mm HYSD steel stirrups. Use M 20 grade of concrete and Fe-415 grade of steel.	**07**
Q.3	**(a)**	A reinforced slab 120 mm thick is supported by simply supported T – beams with an effective span of 3.6 m. T- beams are spaced 3.2 m center to center. The effective depth and width of the web are 560 mm and 450 mm respectively. 8 nos. of HYSD bars are provided in 2 layers in tension side with an effective cover 50 mm. Determine the depth of neutral axis and moment of resistance of T-beam. Use M20 concrete and Fe 415 steel.	**07**
	(b)	Design a simply supported one way slab having clear span of 3 m x 7 m supported on 250 mm wide beams. The slab carries a 3 kN/m^2 live load and 1.0 kN/m^2 floor finish load. Use M 20 grade of concrete and Fe 415 grade of steel. Check criteria for deflection and development length.	**07**
		OR	

Q.3 **(a)** Design a continuous rectangular RC beam of span 6 m to carry self-weight load, fixed imposed load of 10 kN/m and live load of 15 kN/m. The beam continuous over a three span. Use M 20 grade of concrete and Fe 415 grade of steel. **07**

(b) Design a simply supported RCC slab having clear span 4 m × 4 m rested on the 230 mm thick brick wall, subjected to live load of 3 kN/m^2 for the corners held down condition. Use M 20 grade of concrete and Fe 415 grade of steel. Checks are not required. Provide detailed sketches. **07**

Q.4 **(a)** Design a single flight staircase in a residential building, having floor height of 3 m. Staircase is supported at top and bottom riser by beam having width 300 mm. Consider Thickness of waist slab is 180 mm, riser is 200 mm and tread is 300 mm. Use M 30 grade of concrete and Fe 415 grade of steel. **07**

Evaluate :

(a) The effective span
(b) Design load
(c) Reinforcement in waist slab.
(d) Prepare a detail sketch of staircase.

(b) Design a short circular R.C.C. column to carry an axial load of 2000 kN. Use M25 grade concrete and Fe-415 grade steel. Show the reinforcement details with neat sketches. **07**

OR

Q.4 **(a)** Design a dog legged staircase in a residential building with clear dimensions of staircase area as 2000 mm × 4000 mm. Floor to floor height is 3.2 m. Use M 30 grade of concrete and Fe 415 of steel. **07**

(b) Design a R.C.C. short column square in section to carry out factorized design axial load of 4500 kN. The unsupported length of column is 3 m. Show the reinforcement details with neat sketches. **07**

Q.5 **(a)** Design an isolated pad Footing for a square R.C.C. column of size 400 mm × 400 mm carrying an axial load of 1800 kN. Safe bearing capacity of soil is 200 kN/mm2. Use M-20 grade concrete and Fe-415 as steel reinforcement. Check for shear and bearing pressure is not required. Show the details with neat sketches **07**

(b) Design a combined rectangular footing for 1200 kN and 1700 kN column loads spaced at 4 m centre to centre. Each size of the column is 500 mm × 500 mm and Safe bearing capacity of soil is 280 kN/m^2. Use M 20 grade of concrete and Fe 415 grade of steel. **07**

OR

Q.5 **(a)** Design a square isolated sloped footing for a column of size 600 mm × 600 mm carrying a service axial load of 2000 kN. Safe bearing capacity of soil is 250 kN/m^2. Use M 20 grade of concrete and Fe 415 grade of steel. Check for one way share only. **07**

(b) Design a cantilever retaining wall (T type) to retain earth for a height of 4m. The backfill is horizontal. The density of soil is 18 kN/m^3. Safe bearing capacity of soil is 200 kN/m^2. Take the co-efficient of friction between concrete and soil as 0.6. The angle of repose is 30°. Use M20 grade of concrete and Fe 415 grade of steel. **07**

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