Reg. No. | | | | | | | | | | | | | |

B.E / B.TECH.DEGREE EXAMINATION, MAY 2023

Fifth Semester

CE18502 – DESIGN OF REINFORCED CONCRETE ELEMENTS

(Civil Engineering)

(Regulation R2018)

(Use Code Book IS 456-2000, Design Charts and Relevant Tables of SP16)

TIME:3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO1	Differentiate the various design methodologies for the design of RC elements and design beam by Working stress method and limit state method.	3
CO2	Design the various types of beams and slabs by limit state method.	3
CO3	Design the various types of slabs by the limit state method.	3
CO4	Design columns for axial, uniaxial and biaxial eccentric loadings.	3
CO5	Design the axially and eccentrically loaded footings by limit state method.	3

PART- A(10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	What is the significance of doubly reinforced section?	1	2
2.	List out the minimum and maximum area of tension reinforcement in beam.	1	2
3.	Determine the anchorage length for 20 mm diameter bar.	2	3
4.	What are the different modes of shear failure in RCC beams?	2	2
5.	What is the importance of two-way slabs over one way slab?	3	1
6.	Why corner reinforcement is provided in a two-way slab? And sketch the edge and middle strips of a two-way slab?	3	1
7.	Write the pitch and diameter of lateral ties for columns as per IS 456.	4	1
8.	State the condition for the pitch for lateral ties to be checked.	4	2
9.	Under what circumstances combined rectangular footing are adopted.	5	2
10.	Compare one way and two-way shear in footing.	5	1

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PART- B (5x 14=70Marks)

		Marks	CO	RBT LEVEL
11. (a)	Compute the moment of resistance of a singly reinforced beam 160 mm width and 300mm effective depth to the centre of reinforcement, if the stresses in steel and concrete are not to exceed 140 N/mm^2 and 5 N/mm^2. The reinforcement consists of 4 bars of 16 mm diameter take m = 18. If the above beam is used over a effective span of 5 m. Find the maximum load of beam it can carry including its own weight.	(14)	1	3
	(OR)			
(b)	A rectangular concrete beam is supported on two walls 750 mm thick, spaced at a clear distance of 6.5 m. The beam carries a superimposed load of 30 kN/m. Design the beam using working stress method. Use M25 grade concrete and Fe500 grade steel. Draw reinforcement details.	(14)	1	3
12. (a)	Design the reinforcement required for a rectangular beam section with the following data: Size of the beam section = 350 mm x 700 mm Factored shear force = 95 kN Factored torsional moment = 45 kNm Factored bending moment = 115 kNm Materials = M25 Grade concrete and Fe500 steel. Adopt limit state method of design.	(14)	2	5
	(OR)			
(b)	A cantilever beam having width of 200 mm and effective depth 300mm supports UDL and is reinforced with 4 bars of 16 mm diameter. If the factored total load is 80 kN. Calculate 1. Maximum local bond stress 2. Anchorage and development bond length required 3. Aerage bond stress	(14)	2	5
13. (a)	Design a R.C. slab for a room having inside dimensions 3 m x 6 m. The thickness of supporting wall is 300 mm. The slab carries 100 mm thick lime concrete at its top, the unit weight which may be taken as 19kN/m. The live load on the slab may be taken as 2.5 kN/m. Assume the slab to the simply supported at the ends. Use M30 grade concrete and Fe500 grade steel.	(14)	3	3
	(OR)			

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(b)	Design a slab over a room 4.5 m x 6 m. the slab is supported on masonry walls all round, with adequate restraint and corners are held down. The live load on the slab is 3000 N/m^2. The slab has a bearing of 150 mm on the supporting walls. Use M30 grade concrete and Fe500 grade steel.	**(14)**	**3**	**3**
14. (a)	Design the longitudinal reinforcement in a short column 400mm x 600mm subjected to an ultimate axial load of 1600 kN together with ultimate moments of 120 kN-m and 90 kN-m about the major and minor axis respectively. The reinforcements are distributed equally on all four sides. Adopt M25 grade concrete and Fe500 steel bars.	**(14)**	**4**	**3**
	(OR)			
(b)	Design a rectangular column, 5m long restrained in position and direction at both ends, to carry an axial load of 120kN. Adopt M25 grade of concrete and Fe500 grade of steel.	**(14)**	**4**	**3**
15. (a)	A rectangular column of size 300mm x 450mm transmits a limit state load of 600 kN at an eccentricity of 150mm about the major axis. Design a suitable isolated footing for the column by the limit state concept. Safe capacity of soil is 200 kN/m^2. Use M30 concrete and Fe 500 steel.	**(14)**	**5**	**3**
	(OR)			
(b)	A square column of size 400mm carries a service load of 600 kN. Design an isolated footing for the column by limit state method, if the safe bearing capacity of the soil is 250 kN/m^2. Use M25 grade concrete and Fe 500 grade steel.	**(14)**	**5**	**3**

PART- C(1x 10=10Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	Design the beam to carry a factored moment of 145 kNm. Use M30 grade concrete and Fe 500 grade steel.	**(10)**	1	3

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