Basavarajeswari Group of Institutions

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

USN										Course Code	2	1	C	V	5	1

Fifth Semester B.E. Degree Examinations, April/May 2024

DESIGN OF RC STRUCTURAL ELEMENTS

Duration: 3 hrs **Max. Marks: 100**

Note: ***1. Answer any* FIVE *full questions choosing ONE full Question from each Module.***
2. Use of IS 456-2000 and SP-16 is permitted.
3. Missing data, if any, may be suitably assumed.

Q. No		*Question*	*Marks*	*(RBTL:CO:PI)*
		Module-1		
1.	**a.**	Clearly distinguish between working stress method and limit state method of RC sections.	**10**	(1 :1 : 1.2.1)
	b.	Apply the knowledge of the limit state method to define stress block and derive the expression for stress block parameters for compressive force Cu, Tensile force Tu, and locate its depth X = 0.42 xu from the top compression fiber.	**10**	(1 :1 : 1.2.1)
		(OR)		
2.		A RCC beam 300 mm wide and 600 mm deep is reinforced with 4 numbers of 20 mm dia bars of grade Fe 415 steel on tension side with an effective cover of 50 mm over an effective span of 5 m . Determine the short term deflection to an imposed working load of 18 kN/m. Use M20 grade of concrete and Fe 415 steel.	**20**	(3 :1 : 2.1.3)
		Module-2		
3.	**a.**	A RCC rectangular beam of 300 mm wide and 600 mm deep is reinforced with 4 bars of 20 mm diameter with cover of 30 mm. Analyse the ultimate moment of resistance of the beam. Use M20 grade of concrete and mild steel.	**10**	(3 :2 : 2.1.3)
	b.	A doubly reinforced beam section is 250 mm wide and 450 mm deep to the centre of the tensile reinforcement. It is reinforced with #2-16mm dia as compression reinforcement at an effective cover of 50 mm and #4-25 mm dia as tensile steel. Using M20 concrete and Fe250 steel. Calculate the ultimate moment of resistance of the beam section.	**10**	(3 :2 : 2.1.3)
		(OR)		
4.	**a.**	A RCC T beam has a following data: Df= 100 mm, bw = 350 mm, d = 500 mm, bf = 1200 mm, Ast= #6-22 mm diameter. Calculate the ultimate moment of resistance. Use M20 grade of concrete and Fe 415 steel.	**10**	(3 :2 : 2.1.3)
	b.	A RCC beam 250 mm wide and 450 mm deep, is reinforced with 3-25 mm diameter of grade 415 steel on tension side with an effective cover of 50 mm. If the shear reinforcement of 2 legged 8 mm stirrups of spacing 160 mm c/c is provided at a section. Determine the design strength of the section. Use M20 grade concrete and Fe415 steel.	**10**	(3 :2 : 2.1.3)

Module-3

5.	Design a simply supported beam of span 7 m carries a live load of 15 kN/m. Use M20 grade of concrete and Fe415 steel.	**20**	(3 :3 : 3.1.4)
	(OR)		
6.	A classroom in an engineering college building measuring 9 m × 18 m of effective dimensions. It is provided with a T-beam slab floor such that beams are spaced at 3 m c/c and take a live load 3.5 kN/m^2. Floor finishes 0.6 kN/m^2. Use M20 Grade and Fe 415 steel. Design the interior T-beam and sketch the reinforcement details.	**20**	(3 :3 : 3.1.4)

Module-4

7.	Design a simply supported slab of room size 3.5 m × 9.5m carries a live load 4 kN/m2 and floor finish 1 kN/m^2. Use M20 Grade and Fe415 steel.	**20**	(3 :4 : 3.1.4)
	(OR)		
8.	Design a dog-legged staircase for an office floor room measuring 3 × 6 m, clear vertical distance between the floors is 3.5. The width of the flight is 1.25 m. Assume an imposed load of 4 kN/m^2. Use M-20 grade of concrete and Fe-415 steel, assume the stair is supported on 230 mm width support at the outer edge of the landing slab.	**20**	(3 :4 : 3.1.4)

Module-5

9.	Design the reinforcement for a column of size 300 mm × 400 mm having an effective length 3.5 m. A factored load of 1000 kN and a factored moment of 150 kN-m about the major axis of the column. Use M25 grade of concrete and Fe 415 steel ,provide the reinforcement (i) On two sides (ii) On all the four sides	**20**	(3 :5 : 3.1.4)
	(OR)		
10	A reinforced concrete column 400 mm × 400 mm supports an axial service load of 850 kN. The SBC of the soil at site is 190 kN/m^2. Adopt M-20 grade of concrete and Fe-415 steel, design a square footing for the column and sketch the reinforcement details.	**20**	(3 :5: 3.1.4)

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Note: (RBTL - Revised Bloom's Taxonomy Level: CO - Course Outcome: PI– Performance Indicator)