C **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 55103

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2019

Fifth Semester

Civil Engineering

15UCE503- DESIGN OF REINFORCED CONCRETE ELEMENTS

(IS456-2000 and SP16 Permitted)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. Which of the following philosophies are related to design of reinforced concrete structures? CO1- R

   (a) Working stress method (b) Ultimate load method

   (c) Limit state method (d) Allowable stress design

2. The width of the flange of a T-beam, which may be considered to act effectively with the rib depends upon CO2- R

   (a) Breadth of the rib (b) Overall thickness of the rib

   (c) Span of the T-beam (d) All the above

3. An R.C.C. column is treated as long if its slenderness ratio is greater than CO3- R

   (a) 30 (b) 40 (c) 50 (d) 60

4. In a combined footing if shear stress exceeds 5 kg/cm^2, the nominal stirrups provided are CO4- R

   (a) 6 legged (b) 8 legged (c) 10 legged (d) 12 legged

5. For stairs spanning horizontally, the minimum waist provided is CO5- R

   (a) 6 cm (b) 8 cm (c) 10 cm (d) 12 cm

PART – B (5 x 3= 15Marks)

6.	What are the three methods of design of reinforced concrete structural elements?	CO1- U	
7.	When shear reinforcement is necessary in a beam?	CO2- R	
8.	What are the assumptions made in the design of short columns?	CO3- U	
9.	What are the guidelines to be followed while lapping the bars?	CO4- R	
10.	List out the different types of staircase.	CO5- R	

PART – C (5 x 16= 80Marks)

11.	(a)	Design a simply supported singly reinforced concrete beam to suit the following data: Clear Span = 5m, Width of supports = 30mm,Dead load = 3kN/m Live load = 4 kN/m, Adopt M 25 and Fe 500 grade.	CO1-U	(16)
		Or		
	(b)	Design a simply supported R.C. slab for a roof of a hall 4.5 mx10 m (inside dimension with 230 mm walls all around). Assume a live load of 4.5kN/m and a floor finish of 1kN/m. Adopt limit state design. Use M 20 grade concrete and mild steel.	CO1-App	(16)
12.	(a)	Write down the step by step procedure for a Flanged beam section in Limit state method.	CO2-U	(16)
		Or		
	(b)	A rectangular beam width b = 250mm and effective depth 500mm reinforced with 4 bars of 20mm diameter. Determine the shear reinforcement required to resist a shear force of 150kN. Use concrete M20 and steel Fe415.	CO2-App	(16)
13.	(a)	Design the reinforcement in a column of size 450 mm × 600 mm, subject to an axial load of 2000kN under service dead and live loads. The column has an unsupported length of 3.0m and is braced against sideway in both directions. Use M 20 concrete and Fe 415 steel.	CO3-App	(16)
		Or		
	(b)	Design the reinforcement in a spiral column of 400 mm diameter subjected to a factored load of 1500kN. The column has an unsupported length of 3.4 m and is braced against sideway. Use M 25 concrete and Fe 415 steel.	CO3-App	(16)

14.	(a)	Design a plain concrete footing for a column, 300 mm × 300 mm, carrying an axial load of 330kN (under service loads, due to dead and live loads). Assume an allowable soil bearing pressure of 360kN/m^2 at a depth of 1.0 m below ground. Assume M 20 concrete and Fe 415 steel.	CO4-App	(16)
		Or		
	(b)	Design a combined rectangular footing for two columns 300mmx300mm spaced at 4m centers, each supporting a factored load of 750kN. safe bearing capacity of soil = 225kN/m^2 . Use concrete M20 and steel Fe415.	CO4-App	(16)
15.	(a)	Design a dog legged stairs to be provided in a residential multi storied building. Clear space available is 3m x 4.8m. Floor to floor height is 3.6 m. length of landing on either side along the direction of flight is 1.2 m .exposure condition is moderate.	CO5-App	(16)
		Or		
	(b)	Design the waist slab type staircase comprising a straight flight of steps, supported between two stringer beam along the two sides given Riser = 150mm, Tread= 300 mm width of staircase = 2.0m, width of beam = 300 mm. Assume a Live load of 5.0 KN/m^2 and moderate exposure condition.	CO5-App	(16)

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