Total number of printed pages: **Programme (UG)/5th Sem/ UCE 501**

2022

SUBJECT NAME: Design of RCC Structures (UCE 501)

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1.	a)	What is modular ratio? Why does the code specify an effectively higher modular ratio for compression reinforcement compared to tension reinforcement? What do you mean by neutral axis depth? Write the process to determine neutral axis depth for a rectangular beam in WSM and LSM methods. How do you determine ultimate moment of resistance for balanced, under-reinforced and over-reinforced sections in a) WSM and b) LSM.	10
	b)	A doubly reinforced beam section has a size of 250 X 450 mm total depth. It is reinforced with 4-16 Φ as compression reinforcement and 4-28 Φ as tensile reinforcement. Assume M25 concrete and Fe 415 steel and clear cover as 30 mm. Determine the stresses in concrete, compression steel and tension steel. Also determine allowable moment of resistance and ultimate moment of resistance	10
2.	a)	A rectangular beam of 7-m span (c/c), resting on 300 mm wide simple supports, is to carry a uniformly distributed dead load (excluding self-weight) of 15 kN/m and a live load of 20 kN/m. Using Fe 415 steel, design the beam section at midspan. Also perform a check for deflection control. Assume that the beam is subjected to moderate exposure condition.	13
	b)	Define development length. What is its significance? What are the mechanisms of bond resistance? Differentiate between Flexural bond and Anchorage bond.	7
3.		A restrained concrete slab is of size 3m X 5m having 2 long edges discontinuous. Design the slab if the live load is 5 kN/m^2 and surface finish of 2 kN/m^2. Assume M25 concrete and Fe 415 steel.	20
4	a)	Assuming the beam in question no. 2 (a), design the beam for shear reinforcement at i) support and ii) at midspan. Assume M 25 concrete and Fe 415 steel.	10

	b)	Design a 1-way slab of clear span 4 m simply supported on 230 mm thick walls and subjected to a live load of 10 kN/m^2 and surface finish of 1 kN/m^2. Use M25 concrete and Fe 415 steel.	10
5		Write short notes on: a) Slenderness ratio, b) Effective length, and c) Unsupported length of a compression member. A column of size 450 X 550 mm has an unsupported length of 3.2m and is subjected to a load of 2000 kn. Design a column for M25 concrete and Fe 415 steel considering both ends of the column as effectively held in position but not restrained against rotation.	6+14 =20
6		Define isolated and combined footing with figures. Design an isolated footing for a column of size 300 X 500 carrying an axial load of 1500 kN. The safe bearing capacity of the soil is 150 kN/m^2. Use M25 concrete and Fe 415 steel.	4+16=20