Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, JUNE 2022

SUBJECT: **BASIC REINFORCED CONCRETE DESIGN [CIE 2251]**

REVISED CREDIT SYSTEM

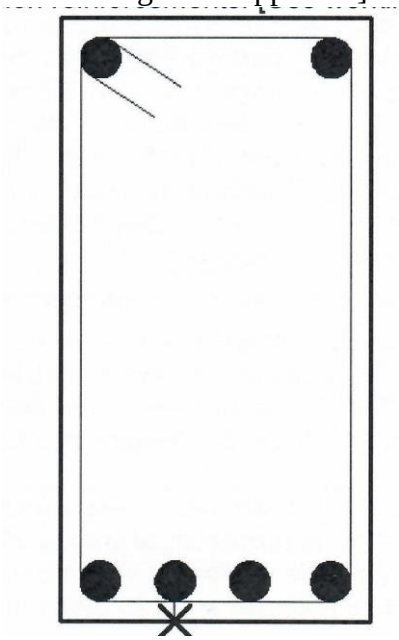
(_ / 06 / 2022)

Time: 3 Hours Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions
- Missing data may be suitably assumed
- Use of IS 456:2000 and SP-16 handbooks are permitted
- Consider limit state approach unless specified otherwise

Q.No		Marks	CO
1.	A reinforced concrete beam of 230 mm wide and an effective depth of 450 mm is reinforced with 3 bars of 20 mm diameter. Using M25 grade concrete and Fe415 grade steel, state the type of beam. (Use working stress method)	3	2
2.	Design the end span of a continuous beam of effective span 6.2 m. The beam is subjected to a dead load of 20 kN/m and a live load of 15 kN/m at working conditions. Assume M25 grade concrete and Fe415 steel. The beam is subjected to moderate exposure condition. Width of the beam is restricted to 230 mm. Check for spacing of main reinforcements, shear check, deflection, and development length calculations are not required.	7	2
3.	Differentiate between under reinforced and over reinforced beam sections.	2	1
4.	Design a simply supported slab for a room dimension of 4.0m x 6.0m resting on a masonry wall of 250 mm width. The working live load on slab is 2.0kN/m^2. 4 Adopt M20 grade concrete and Fe415 grade steel. Consider moderate exposure condition. (Check for shear, check for deflection and sketch of reinforcement details not required)	8	3
5.	Calculate the moment of resistance of a T-beam with a slab thickness of 150 mm, effective flange width of 2200 mm, and breadth of web is 200 mm and effective depth of the beam is 450 mm. It is reinforced with 4 bars of 16 mm diameter on the tension side. The materials used are M25 grade concrete and Fe415 steel	5	2
6.	A square short column supports a factored axial load of 1400kN with effective length of 3 m and both ends hinged. Design the longitudinal reinforcement and lateral ties if M20 grade concrete and Fe415 grade steel are used with effective cover 54 mm.	5	4
7.	A column of effective length 3 m of size 250 mm x 500 mm is subjected to factored axial load of 1600kN and factored moment of 175 kN-m along major axis and 75 kN-m along minor axis. Taking effective cover as 50mm, M30 grade concrete and Fe415 grade steel, design for the longitudinal reinforcement and check the adequacy of design assuming distribution of bars equally on four sides.	5	4

	The column is hinged at both the ends. Check for spacing of longitudinal bars and lateral tie design need not be done.		
8.	A column of size 300mm x 500mm is subjected to factored axial load of 1550kN and factored moment of 25kN-m about major axis. The unsupported length is 3 m with both ends hinged. Consider M25 grade concrete, Fe415 grade steel and effective cover 50 mm. Calculate the area of longitudinal reinforcement. No need to design lateral ties and check for spacing of longitudinal bars.	3	4
9.	Write a short note on types of footings.	2	4
10.	Calculate the initial plus creep deflection due to permanent loads only (α_i,cc (perm)) for a simply supported beam of span 4 m of size 230 mm x 500 mm. Permanent load on the beam is 20 kN/m, the beam is reinforced with 2 bars of 20 mm diameter on tension side. The depth of neutral axis is 240.47 mm and cracking moment is 39.94 x 106 N.mm. Use M20 grade concrete and Fe 415 steel. Assume an effective cover of 45 mm. Age of concrete at loading is 28 da s. [Use working stress approach]	5	5
11.	Calculate crack width at the location as indicated for a beam of size 300 mm x 600 mm as shown in the fig. The beam is reinforced with 4 bars of 16 mm diameter on tension side and 2 bars of 12 mm diameter on compression side with 8 mm diameter stirrups. The beam is subjected to a bending moment of 110 kN.m at working condition. The depth of neutral ais is 117 mm. Use M40 grade concrete and Fe 415 steel. Assume a clear cover of 40 mm for both compression and tension reinforcements. [Use working stress approach] 	5	5