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IV SEMESTER B.TECH. END SEMESTER EXAMINATIONS

May 2024

SUBJECT: BASIC REINFORCED CONCRETE DESIGN [CIE 2223]

Date of Exam:

Time of Exam:

Max. Marks: 50

Instructions to Candidates:

- ✤ Answer all questions.
- Any missing data may be suitably assumed.
 Use of IS 456:2000 and SP-16 handbooks are permitted.

Q. No.	Questions	Marks	СО	BL
1A.	With a neat figure explain the stress block parameter as per the assumptions of IS 456:2000.	5	1	2
1B.	A simply supported beam having an effective span of 3.75 m carries a working load of 25 kN/m. The grade of concrete is M25 and grade of steel is Fe415. The beam is exposed to mild exposure condition. Assume breadth of the beam as 230 mm. Also assume span to depth ratio as 10 for the initial calculation of effective depth. Assuming 16 mm bars, determine the area of steel and number of bars. Shear design, checks for deflection and development length not required.	5	2	3
2A.	A beam of size 230 mm wide 460 mm effective depth is reinforced with 5 bars of 16 mm diameter on the tension side. If the factored shear force at the critical section is 90 kN, calculate the shear reinforcements. Assume the grade of concrete and steel as M20 and Fe415, respectively. Also, assume 8 mm diameter 2 LVS.	5	2	3
2B.	An RCC continuous beam of size 300 mm wide and 570 mm effective depth is subjected to a factored dead load and live loads of 22 kN/m and 14 kN/m respectively. Determine the area of main reinforcement required (sagging and hogging) for the end span of 6 m (effective). Consider M20 concrete and Fe415 steel. Shear design, checks for deflection and development length not required.	5	2	3
3A.	A simply supported one-way slab of clear span 3 m is supported on masonry walls of thickness 350 mm. Assume a floor finish load of 1 kN/m ² and a live load of 2 kN/m ² at service conditions. Determine the area of main reinforcement. For effective depth approximation, consider Span to depth ratio of 28. Consider mild exposure conditions. Check for deflection and shear not needed. Consider M25 concrete and Fe415 steel.	5	3	3
3B.	An interior two way panel of size 4 m × 6 m is supported on beams of 230 mm thickness. The slab is restrained from lifting. If the effective depth of the slab is 110 mm with an effective cover of 25 mm, calculate the main reinforcement area along short span only. The total factored load on the slab is 15 kN/m ² (inclusive of DL and LL). Assume M25 grade concrete and Fe415 grade steel. Check for deflection and shear not needed.	5	3	3



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4A.	A column of size 600 mm × 600 mm is subjected to an axial working load of 3000 kN. The unsupported length of the column is 3 m and it is effectively held in position at both the ends but not restrained against rotation. Assuming #20 bars determine the main reinforcement only. Consider M30 concrete and Fe415 steel. Check for spacing and design of ties are not necessary.	5	4	3
4B.	A rectangular column of size 300 mm × 400 mm is subjected to an ultimate load of 1200 kN and an ultimate moment of 200 kN.m with respect to its major axis. Determine the main reinforcement assuming #16 bars. Consider M20 concrete and Fe415 steel. Assume an effective cover of 50 mm. Assume the effective length of the column as 2.75 m and unsupported length as 3.4 m. Check for spacing and design of ties are not necessary.	5	4	3
5A.	An isolated footing of size $3.5 \text{ m} \times 1.8 \text{ m}$ is subjected to a soil pressure of 145 kN/m ² at service loads. The size of the column is 230 mm× 450 mm. Determine the depth of footing based on i) single shear criterion and ii) double shear criterion. Assume M30 grade concrete, Fe415 steel and an effective cover of 50 mm for the footing. Also assume a steel of 0.25% for the footing.	5	5	3
5B.	Determine the depth of foundation and size of a rectangular isolated footing for a column of size 230 mm×450 mm. The column is subjected to an axial service load of 1250 kN. The SBC of soil is 200 kN/m ² and angle of internal friction of soil is 35°. Unit weight of the soil is 19.5 kN/m ³ . Also, determine the thickness of the footing slab based on bending moment criterion only. Assume M30 grade concrete and Fe415 steel	5	5	3