Question Paper Code: R18A31CE02

R18

ANURAG Engineering College

(An Autonomous Institution)

III B.Tech I Semester Supplementary Examinations, December-2024

STRUCTURAL ENGINEERING – I

(CIVIL ENGINEERING)

Time: 3 Hours **Max. Marks: 75**

Section – A (Short Answer type questions) (25 Marks)

Answer All Questions

		Course Outcome	B.T Level	Marks
1.	As per IS: 456, permissible direct compressive stress for M-25 grade concrete in working stress method of design is---------?	CO1	L2	2M
2.	According to IS: 456-2000, the limiting depth of neutral axis in case of Fe-250 grade steel is---- ?	CO1	L2	3M
3.	Make use of IS:456:2000, the anchorage value of a standard U-type hook shall be equal to----- the diameter of the bar?	CO2	L2	2M
4.	A R.C.C beam b = 400 mm, D =700 mm d = 650 mm, equivalent shear (V) =300 kN, shear (V) =100 kN calculate the torsional moment (T)?	CO2	L2	3M
5.	Make use of IS:456-2000, At corners where slab is continuous over both the edges, calculate the required torsion steel to be provided.	CO3	L2	2M
6.	Make use of IS:456-2000, A simply supported slab 4 m and overall depth is 150 mm, calculate the area of distribution reinforcement required when Fe-250 is used.	CO3	L2	3M
7.	Make use of IS:456:2000, the recommended value of the effective length of the column when effectively held in position and restrained against rotation in both ends?	CO4	L2	2M
8.	Make use of IS:456:2000, write the minimum and maximum % of steel required in columns.	CO4	L2	3M
9.	Make use of IS:456-2000, In R.C. footing on soils, the thickness at the edge should not be less than?	CO5	L2	2M
10.	Make use of IS:456-2000, Draw the critical section for punching shear in case of footings?	CO5	L2	3M

Section B (Essay Questions)

Answer all questions, each question carries equal marks. **(5 X 10M = 50M)**

11.A)	Compare and contrast among balanced, under reinforced and over reinforced sections with reference to the following aspects. (Working stress method). i) Depth of neutral axis ii) amount steel required iii) Moment of resistance iv) Lever arm v) Type of failure	CO1	L3	10M
	OR			
B)	Design the tension reinforcement for a singly reinforced concrete section having breadth 300 mm and depth 675 mm subjected to a factored moment of 185 kNm. Adopt M-20 grade concrete and HYSD bars of grade 415.	CO1	L3	10M
12.A)	A reinforced concrete beam of rectangular section 300 mm wide and 600 mm effective depth is reinforced with 4 bars of 25 mm diameter. The beam has to resist a factored shear force of 400 kN at support section. Assuming M-20 grade concrete and Fe 415 HYSD bars, design vertical stirrups for the section.	CO2	L3	10M
	OR			

B)	A reinforced concrete beam of rectangular section with a width of 350 mm and overall depth 700 mm is subjected to an ultimate torsional moment of 100 kNm together with an ultimate bending moment of 200 kNm. Adopting M-20 grade concrete and Fe-415 HYSD bars and assuming top and bottom covers of 50 mm and side covers of 25 mm, design suitable longitudinal and transverse reinforcements for the section.	CO2	L3	10M
13.A)	Design a slab for a room of clear internal dimensions 3 m × 5 m supported on walls of 300 mm thickness, with corners held down. Two adjacent edges of the slab are continuous and other two are discontinuous. Live load on the slab is 3 kN/m^2 . Assume floor finish of 1 kN/m^2 . Use M20 grade concrete and Fe-415steel	CO3	L3	10M
	OR			
B)	Design a Dog legged staircase if supported on walls 230 mm thick along landing slab at both ends. Assume Floor finish = 1 kN/m^2; Live load = 4 kN/m^2; riser R = 160 mm, tread T = 250 mm, M 20 and Fe 250.	CO3	L3	10M
14.A)	Design the reinforcement for a column of size 400 mm × 600 mm to support a load of 2000 kN. Use M-20 grade concrete and Fe - 415 steel. The column has an unsupported length of 3 m and is braced against side sway in both directions.	CO4	L3	10M
	OR			
B)	A column of size 300 mm × 400 mm is subjected to P_u = 1200 kN and M_u = 200 kNm about the major axis. Design the column using M-20 concrete and Fe-415 steel. Provide steel on all two short sides. Assume a cover of 50 mm.	CO4	L3	10M
15.A)	A footing has to transfer a load of 1000 kN from a square column 400 mm × 400 mm (with 16 mm bars). Assume f_{ck} = 20 N/mm^2 and f_y= 415 N/mm^2. Safe bearing capacity of soil is 200 kN/m^2. Design the footing.	CO5	L3	10M
	OR			
B)	Design a reinforced concrete circular footing for a circular column of 300 mm diameter supporting a design ultimate load of 750 kN. The safe bearing capacity of the soil at site is 200 kN/m^2. Adopt M-20 and Fe-415	CO5	L3	10M