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December 2023 (ENDSEM) EXAM

SY /TY/B.TECH (SEMESTER - I)

COURSE NAME: Structural Design and Drawing - I **Branch: Civil Engineering** **COURSE CODE: CVUA31202**

(PATTERN 2020)

Time: [1Hr. 30 Min] **[Max. Marks: 40]**

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator, IS 456:2000 and interaction curves are allowed**
3) **Use suitable data wherever required**
4) **All questions are compulsory. Solve any one sub question from Question 3 and any two sub questions each from Questions 4,5 and 6 respectively.**

Q. No.	Question Description	Max. Marks	CO mapped	BT Level
Q.1	a) The dimension of a rectangular section is 250 mm × 300 mm. with clear cover of 25mm and tensile reinforcement provided is with 3 nos. 16 mm HYSD bars. Calculate the percentage of steel provided.	[2]	CO-1	Apply
Q2	a) The rectangular beam of width, 300 mm is having effective depth of 365 mm. The concrete grade is M20 and the grade of reinforcing steel is Fe 415. The tensile reinforcement is provided by 3-20 mm dia. bars. Calculate the moment of resistance due to steel.	[2]	CO-2	Apply
Q3.	a) A rectangular RC beam of size 300 mm X 650 mm is reinforced with 4 nos. 25 mm diameter bars on tension side at an effective cover of 50 mm. the effective simply supported span of the beam is 6 m and the beam is subjected to factored UDL of 150 kN/m. Design the shear reinforcement. Use M25 grade concrete and Fe 415 grade steel. b) A RC beam of rectangular c/s with a breadth of 350 mm and overall depth of 800 mm is reinforced with 4 nos. 20 mm diameter on tension side at an effective cover of 50 mm. The section is subjected to ultimate moment of 215 kN.m. Estimate the ultimate torsional moment that can be allowed on concrete Use M30 grade concrete and Fe 415 grade steel.	[6] [6]	CO-3 CO-3	Apply Apply
Q.4	a) Design a simply supported one way slab over a room 3.2 m x 6.4 m effective, carrying L.L. of 6 kN/m2 and F.F. of 2 kN/m2. Use M30 and Fe 500 materials. b) The tread depth of a step is 250 mm; the rise height of a step is 150 mm and the overall depth of waist slab is 150 mm with 25 mm effective cover. The thickness of floor finish is 15 mm. Take unit	[5]	CO-4	Apply

	weight of reinforced concrete as 25.0 kN/m3 and unit weight of floor finish as 23.5 kN/m3. Calculate the area of main steel required for the staircase.	[5]	CO-4	Apply
	c) A simply supported slab having effective span of 6 m x 5 m is subjected to a super-imposed load of 10 kN/m2 inclusive of its self-weight, finish etc. and an imposed load of 4 kN/m2. Considering limit state method of design, calculate area of torsional steel required at corner of the slab. Consider section as balanced; grade of concrete and steel are M 25 and Fe 415 respectively. Take all edges discontinuous.	[5]	CO-4	Apply
Q.5	a) Design the longitudinal and transverse reinforcement in the short column to carry an axial force of 500 kN and working moment of 75 kN-m about the major axis. The unsupported length of the column is 3.0 m. The column is fixed at both ends. Use M 20 concrete and Fe 415 steel.	[5]	CO-5	Apply
	b) A short RC column 230 mm X 450 mm is reinforced with 6 nos. 20 mm diameter bars with 3 bars equi-spaced along 450 mm sides. Determine the bending moment about major axis when Pu = 600 kN.	[5]	CO-5	Apply
	c) Design the reinforcement in a spiral column of 400 mm diameter subjected to a factored load of 1500 kN. The column has an unsupported length of 3 m and is hinged at both ends. Use M25 and Fe 415 material.	[5]	CO-5	Apply
Q.6)	a) An isolated footing (size :1800 mm x 1800 mm) is made for a square column of size 300 mm × 300 mm to transfer the ultimate load, P = 1500 kN to the ground. The overall depth of footing is 500 mm. The clear cover is 45 mm. The diameter of reinforcement provided is 12 mm. Show the check for two-way shear for the footing.	[5]	CO-6	Apply
	b) An isolated pad footing for a column 250 mm wide and 550 mm deep is subjected to axial working load of 2000 kN. The safe bearing capacity of the soil is 300 kN/m2. Calculate the dimensions of footing if M25 & Fe 415 materials are used.	[5]	CO-6	Apply
	c) A square isolated footing (size :1800 mm x 1800 mm) is made for a square column of size 300 mm × 300 mm to transfer the ultimate load, P = 1500 kN to the ground. The overall depth of footing is 500 mm. The clear cover is 45 mm. The diameter of reinforcement provided is 12 mm. Show the check for one way shear for the footing.	[5]	CO-6	Apply