

Model Question Paper

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Sixth Semester B.E. Degree Examination DESIGN OF RC STRUCTURAL ELEMENTS

TIME: 03 Hours

Max. Marks: 100

- Note:
01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.
 02. Use of IS: 456-2000, SP-16 is permitted.
 03. Assume suitable additional data, if necessary.

		Module -1	Marks	L	CO
1.	a)	Distinguish between working stresses and limit state methods design.	06 M	L2	CO1
	b)	Define stress block? Derive from the fundamentals the expressions for the area of stress block $0.36f_{ck}bx_u$ and depth of centre of compressive force from the extreme fibre in compression $0.42x_u$.	08 M	L2	CO1
	c)	Enlist the reasons for adopting partial safety factors for loads and material strength..	06 M	L2	CO1
OR					
2.	a)	Explain the terms: balanced, under reinforced and over reinforced sections.	06 M	L2	CO1
	b)	A simply supported beam has a rectangular section and carries a uniformly distributed load of 20kN/m over a clear span of 4.5m. The cross section is 300mm x 550mm and is reinforced with 4 no's of 20mm diameter bar. Assume cover =25mm and bearing=300mm. Assuming, M 20 grade concrete and Fe415 steel, compute short and long term deflection of the beam.	14 M	L3	CO1
Module -2					
3.	a)	A Cantilever R.C.Beam of span 2m is rectangular in cross section 230mm x 380mm, It is reinforced with 3-16 mm diameter bars on tension side. Assume clear cover as 25mm.M20 grade concrete and Fe415 steel is used. Determine the permissible concentrated load at the free end of Cantilever.	10 M	L3	CO2
	b)	Determine the moment of Resistance of a T-beam for the following data: Breadth of the flange=740mm, Effective depth=400mm, Breadth of web=240mm, Area of steel =5-20 and Depth of flange=110mm. Adopt M20 grade concrete and Fe415 steel.	10 M	L3	CO2
OR					
4.	a)	A Doubly reinforced beam section 250mm wide 500mm deep to the centre of the tensile reinforcement. It is reinforced with 3-16mm diameter bars as compression reinforcement at an effective cover of 50mm and 4 bars of 20mm diameter as tension reinforcement. Determine the moment of resistance of the section. Use M20 concrete and Fe500 steel is used.	10 M	L3	CO2
	b)	A Tee beam has the following data: i) C/C spacing of beams=3.20 mt, ii) Simply supported effective span of beam=8m iii) Depth of slab = 150mm iv) Size of web of beam= 300mm x 500mm. Calculate the balanced moment of resistance.	10 M	L3	CO2

Module -3					
5.	a)	Design a beam of effective span 6m to support a total working load of 12kN/m including the self-weight of the beam. The width of the beam is limited to 250mm. Design for flexure and shears only. No need to curtail the bars. Use 16mm diameter main bars and 8mm diameter stirrups. Use M20 concrete and Fe415 steel. Show reinforcement details.	20 M	L4	C02
OR					
6.	a)	A T beam and slab floor system has a slab 125mm thick spanning between T-Beams, which are spaced at 3.5m apart. The beams have a clear span of 8m and end bearings are 300mm wide. The live load on the floor is 4kN/m ² and floor finish is 0.6kN/m ² . Take overall depth of the beam equal to 600mm and web width to 300mm. Take self-weight of the slab and web as 13.90kN/m provide 20mm diameter main bars and 8mm diameter two legged stirrups. Use M20 concrete and Fe415 steel. Design the intermediate T-Beam for flexure and shear only.	20 M	L4	CO2
Module -4					
7.	a)	Design an RC slab for room measuring 4m x 5m is inside. The slab carries a live load of 2kN/m ² and is finished with 20mm topping of unit weight 24kN/m ³ . The slab is simply supported on all four edges with corners free to lift. No need to check for shear. Use M20 concrete and Fe415 steel.	20 M	L4	C03
OR					
8.	a)	Design a dog legged stair for an office building in a room measuring 2.8 x 5.8m, clear vertical distance between the floors is 3.6m. The width of flight is to be 1.25m. Assume imposed load of 3kN/m ² . Use M20 concrete and Fe415 grade steel. Assume that the stairs are supported on 230mm width support at the outer edges of landing slabs. Sketch the reinforcement details. Design of one flight is enough.	20 M	L4	C03
Module -5					
9.	a)	Design the necessary reinforcement for RC column 450mm x 600mm to carry an axial load of 2000 kN. The length of the column is 3.5m. Use M25 grade concrete and Fe415 grade steel. Sketch the reinforcement details.	10 M	L4	C03
	b)	A rectangular column 300mm wide and 500mm deep is subjected to an axial factored load of 1200kN and factored moment of 200kN-m. Calculate the necessary reinforcement distributing equally on all four sides. Sketch the reinforcement details. Adopt M25 and Fe500 grade materials.	10 M	L4	C03
OR					
10.	a)	Design a square footing of flat type for a column of size 400mm x 400mm to carry an axial dead load of 800kN and a live load of 1000kN without any moment. Safe bearing capacity of soil is 180kN/m ² . Adopt M20 grade concrete and Fe 500 grade steel. Sketch the footing showing the details of reinforcement.	20 M	L4	C03

Table showing the Bloom's Taxonomy Level, Course Outcome and Program Outcome				
Question		Bloom's Taxonomy Level attached	Course Outcome	Program Outcome
Q.1	(a)	L2	CO1	PO1,PO2
	(b)	L2	CO1	PO1,PO2
	(c)	L2	CO1	PO1,PO2
Q.2	(a)	L2	CO1	PO1,PO2
	(b)	L3	CO1	PO1,PO2
Q.3	(a)	L3	CO2	PO1,PO2
	(b)	L3	CO2	PO1,PO2
Q.4	(a)	L3	CO2	PO1,PO2
	(b)	L3	CO2	PO1,PO2
Q.5	(a)	L4	CO2	PO1,PO3
Q.6	(a)	L4	CO2	PO1,PO3
Q.7	(a)	L4	CO3,CO4	PO1,PO3
Q.8	(a)	L4	CO3,CO4	PO1,PO3
Q.9	(a)	L4	CO3,CO4	PO1,PO3
	(b)	L4	CO3,CO4	PO1,PO3
Q.10	(a)	L4	CO3,CO4	PO1,PO3
Lower order thinking skills				
Bloom's Taxonomy Levels	Remembering (knowledge): <i>L</i> ₁		Understanding (Comprehension): <i>L</i> ₂	Applying (Application): <i>L</i> ₃
	Higher order thinking skills			
	Analyzing (Analysis): <i>L</i> ₄		Valuating (Evaluation): <i>L</i> ₅	Creating (Synthesis): <i>L</i> ₆