Time: 3-hour **Max. Marks: 80**

Please Note:

1. All questions carry **equal** marks
2. Question **one** is **compulsory**
3. Attempt any **three** out of remaining questions
4. Use of **IS codes** is permitted
5. **Assume** suitable data if required and **state** if clearly.

Q1		Attempt any **4 out of 6 questions**. Each question carry 5 marks.	**20**
	a)	What are the assumptions in working stress method. Draw the stress strain diagram for the singly reinforced beam in working stress method.	
	b)	Explain characteristic strength of material, characteristic load, and partial safety factors.	
	c)	Explain the condition when the beam shall be designed as a doubly reinforced beam.	
	d)	Differentiate one way slab and two way slab.	
	e)	Explain Pu – Mu Interaction Curve.	
	f)	Explain different types of footing with neat sketch.	
Q2	a)	A simply supported beam of width 250 mm and overall depth 550 mm is reinforced with 4 bars of 16 mm diameter on tension side. Clear cover to steel is 25mm.Find the safe UDL it can carry in addition to its self-weight on a span of 4m. Use M20 grade of concrete and Fe 415 steel. Adopt Working Stress Method.	**08**
	b)	A reinforced concrete beam 250mmX600 mm overall depth reinforced with 5 bars of 16mm diameter is used as a simply supported beam over an effective span of 6m. Determine the maximum UDL the beam can carry safely including self-weight. Use M20 concrete and Fe 415 steel. Adopt Limit State Method.	**08**
	c)	Explain Limit State of Collapse and Limit State of Serviceability	**04**
Q3	a)	A doubly reinforced rectangular beam 250mmx 600mm overall depth is reinforced with 3 bars of 16 mm diameter in compression and 4 bars of 20 mm diameter in tension side. Determine the moment of resistance of the section. Use M20 grade concrete & Fe 415 grade of steel. Adopt Working Stress Method	**10**
	b)	Find out the ultimate moment of resistance of a flanged section with flange width = 1050mm, depth of flange = 120mm Area of steel = 5 nos of 20mm diameter Effective depth = 600mm Width of rib = 280mm	**07**
	c)	What are the advantages of T beams over rectangular beams.	**03**

Q4	a)	Design shear reinforcement for a beam of 280mmX 450mm effective depth carrying a factored load of 30kN/m over a span of 6m. It is reinforced with 1256mm^2 steel. Use M20grade of concrete and Fe 415 steel. Adopt Limit State Method.	**10**
	b)	Design a slab for a hall of size 7m X 3m clear span. The slab is simply supported on 230mm wall on all the four sides. Consider live load as 4kN/m^2 and floor finish as 1kN/m^2. Assume M20 grade of concrete and Fe 415 steel. Draw Reinforcement details. Adopt Limit State Method.	**10**
Q5	a)	Design a short circular column with helical reinforcement to carry an ultimate load of 2100kN. Use M20grade of concrete and Fe 415 steel. Draw Reinforcement details. Adopt Limit State Method	**10**
	b)	Explain the need of transverse reinforcement in columns. How can you differentiate short column and long column.	**5**
	c)	Write a note on one way shear and two way shear in footing.	**5**
Q6	a)	Design a short square column to carry an ultimate load of 1800kN. The column is 4m long effectively held in position but not restrained against rotation. Use M20 grade of concrete and Fe 415 steel. Draw Reinforcement details. Adopt Limit State Method	**08**
	b)	Design a square footing for a short axially loaded column of size 350mmX350mm, carrying working load of 700kN. Use M20 grade of concrete and Fe 415 steel. Safe bearing capacity of soil is 180kN/m^2. Draw reinforcement details. Adopt Limit State Method	**12**

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