

Total No. of Questions : 8]

SEAT No. :

P-1412

[Total No. of Pages : 5

[6003]-338

T.E. (Civil)

**DESIGN OF REINFORCED CONCRETE STRUCTURES
(2019 Pattern) (Semester - II) (301013)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.
- 2) Figures in bold to the right indicate full marks.
- 3) Neat diagrams should be drawn where ever necessary.
- 4) IS. 456 is permitted in the examination.
- 5) Additional data if needed, may be suitably considered and clearly mentioned.

Q1) a) A stair hall of a building measures 3.0 m × 5.5 m. The floor to floor height is 3.4 m. Design a dog-legged stair case resting on beams of size 230 mm. The design load on the stairs may be considered as 4 kN/m². Adopt M-25 grade of concrete and Fe-500 grade of steel. Sketch the details of reinforcement. **[14]**

b) What are flanged sections? Explain how the flanged width is calculated. **[3]**
OR

Q2) a) Figure 1 shows the floor plan of a building. The beams are of size 230 mm × 450 mm. Beam B₁ is reinforced with 4-16# bars in tension and 2-10# in compression. The load on the slab is 6 kN/m². Design the beam for shear. Adopt M-25 grade of concrete and Fe-500 grade of steel. Sketch the details of reinforcement. **[14]**

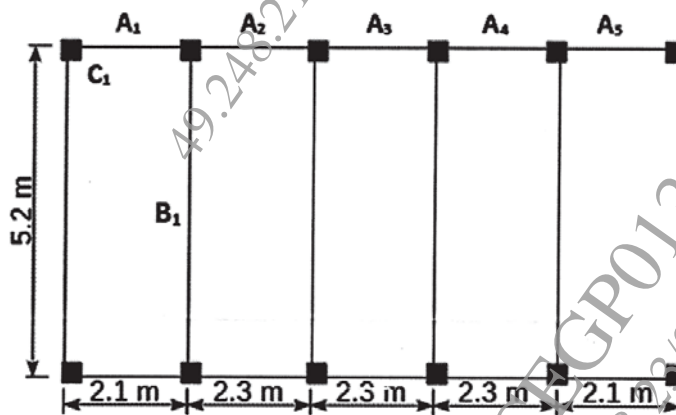


Fig. 1

b) What is torsion? List any three practical situations where concrete beam is subjected to torsion. **[3]**

P.T.O.

- Q3) a)** For the floor plan shown in Fig. 1, design the continuous beam $A_1-A_2-A_3-A_4-A_5$. The total load on the slab is 5.5 kN/m^2 . Design the beam using M-20 grade concrete and Fe-500 grade of steel. Sketch the details of reinforcement. [15]
- b)** Explain the assumptions made in the IS code method of analysis of continuous beams. [3]

OR

- Q4)** Design the beam A-B-C shown in Fig. 2. The load on the beam may be considered as 12 kN/m . Design the beam using M-20 grade concrete and Fe-500 grade of steel. Sketch the details of reinforcement. [18]

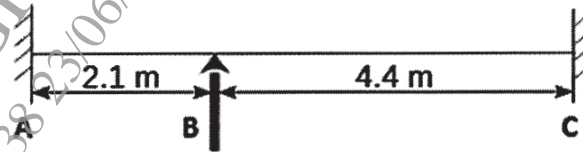


Fig. 2

- Q5) a)** How are reinforced concrete columns classified? Explain the modes of failure. [3]
- b)** For the floor plan shown in Fig. 1, design column C_1 . Show how the column is oriented, The column is subjected to working load of 700 kN , working moment of 90 kN-m about major axis bisecting the depth of column. The unsupported length of column is 4.0 m . The column is fixed at both the ends. Show detailed design calculations and reinforcement details. Use M-30 grade concrete and Fe-500 grade of steel. [14]

OR

- Q6) a)** What are interaction curves? Explain the characteristic of a typical interaction curve. [5]
- b)** Explain the design procedure for axial-loaded, uni-axial loaded, and bi-axial loaded columns. [12]
- Q7) a)** State and explain types of combined footing for two adjoining columns. How do you decide size and projections of combined footing? [9]
- b)** Explain one-way and two-way shear. Also, describe how are they calculated? [9]

OR

- Q8)** A column of size $350 \times 600 \text{ mm}$ is reinforced with 8-20#. The column supports a dead load of 700 kN and imposed load of 450 kN . The safe bearing capacity of the soil is 200 kN/m^2 . Design the footing using M-30 grade concrete and Fe-500 grade of steel. Also, sketch the details of the reinforcement. [18]

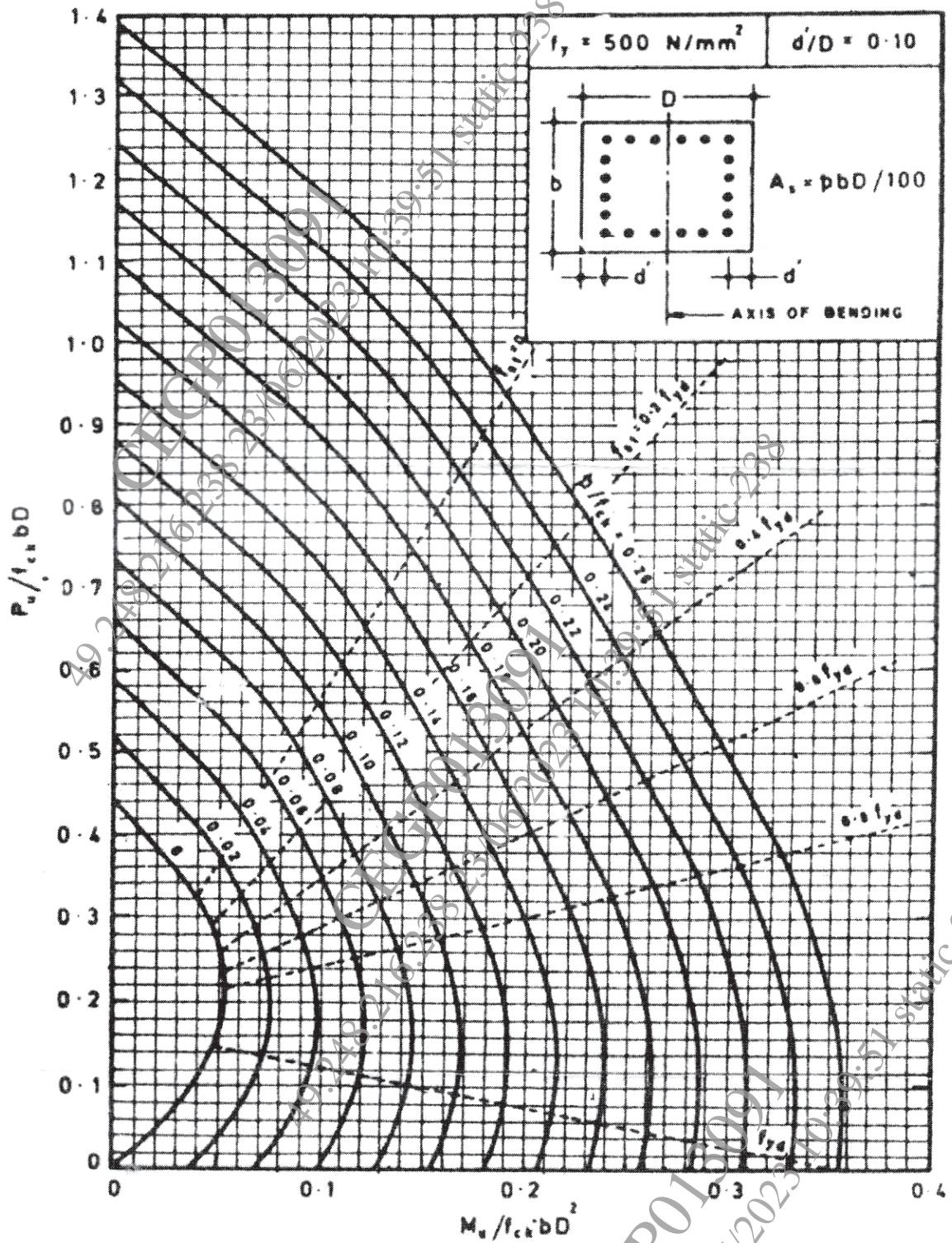


Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

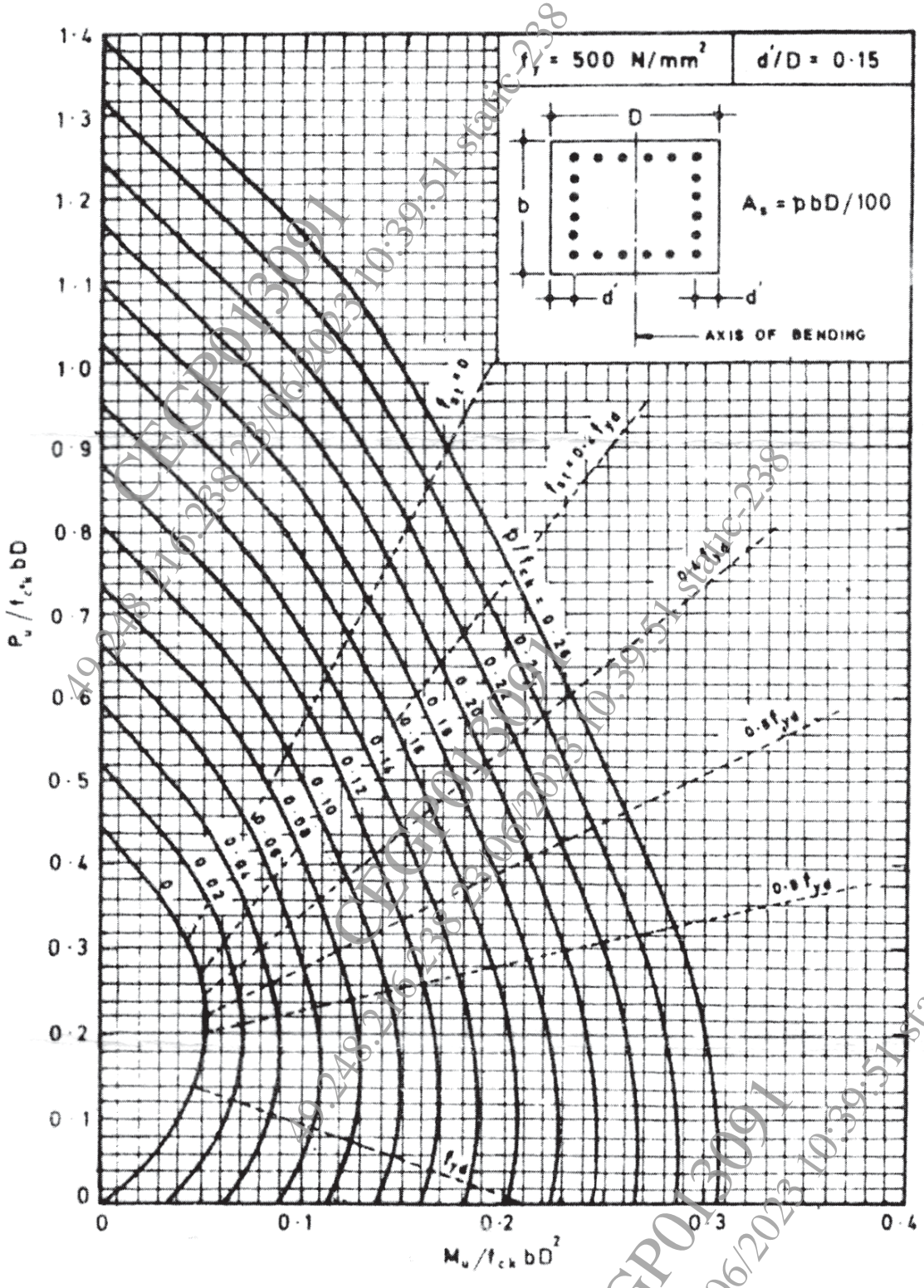


Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

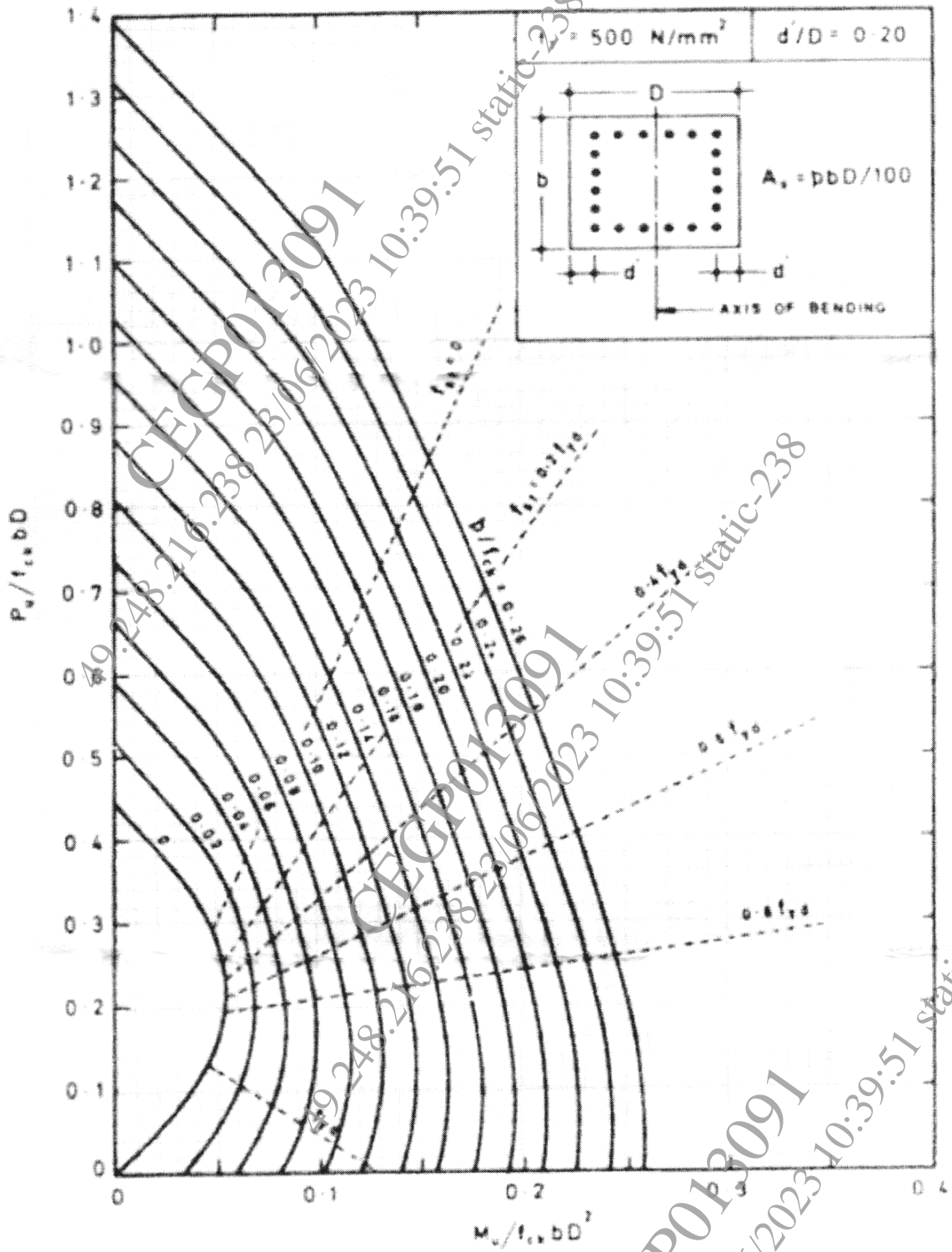


Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

