

Total No. of Questions : 8]

SEAT No. :

**P2935**

**[5058]-9**

[Total No. of Pages : 7

**T.E. (Civil Engineering)**  
**STRUCTURAL DESIGN - II**  
**(2008 Course) (301008) (Semester - II)**

*Time : 4 Hours]*

*[Max. Marks :100*

*Instructions to the candidates:*

- 1) *Attempt Q.1 or Q.2 and Q.3 or Q.4 in section - I.*
- 2) *Attempt Q.5 or Q.6 and Q.7 or Q.8 in section - II.*
- 3) *Answer to the two sections should be written in separate books.*
- 4) *Figures to the right indicate full marks.*
- 5) *Neat diagrams must be drawn wherever necessary.*
- 6) *Use of IS 456-2000 and non programmable calculator is allowed.*
- 7) *Mere reproduction from IS code as answer, will not be given full credit.*
- 8) *Assume suitable data, if necessary.*

**SECTION - I**

- Q1)** a) Draw strain and stress distribution diagrams with all parameters for the design of RCC section of flexural member using LSM. [5]
- b) Draw stress strain curves for concrete in LSM and explain stress and strain values associated with the curves. [5]
- c) A rectangular beam section, 230 mm wide and effective depth 415mm is reinforced with 4 bars of 20mm diameter in the tensile zone and 2 bars of 20mm in the compression zone. The effective span of the beam is 5m. Determine moment of resistance of the section and max. load that the beam can carry in addition to its self weight. Use WSM. Use M20 grade of concrete and Fe 415 grade of steel. [15]

OR

- Q2)** a) Design a cantilever slab for effective span of 1.5m subjected to floor finish of 2kN/m<sup>2</sup> and live load 3kN/m<sup>2</sup>. use Concrete of grade M20 and Fe 500 reinforcement. Draw details of reinforcement. (Use LSM) [8]
- b) Explain the terms bond stress and development length. Calculate development length for 16mm diameter bar in compression and tension by both methods (WSM and LSM). Use M30 concrete and Fe 500 steel. [7]

**P.T.O.**

- c) A Calculate the moment of resistance by LSM for flanged beam section detailed as below [10]
- i) Width of rib = 230 mm
  - ii) Effective flange width = 1600mm
  - iii) Thickness of flange = 125mm
  - iv) Effective depth = 565 mm
  - v) Tension steel = 2-#20 through plus 2-#16 curtail at midspan.
  - vi) Use M20 grade of concrete and Fe 500 grade of steel.

**Q3)** Design floor slabs S7 and S8 only for flexure and torsion. Refer the centerline structural plan given in Figure 1. Width of all beams is 230 mm. Consider live load = 4kN/m<sup>2</sup>, Floor finish = 1.5 kN/m<sup>2</sup>. [25]

Use M25 grade of concrete and Fe 500 grade of steel. Draw neat sketches showing details of main reinforcement and torsional reinforcement in two way slab.

OR

**Q4)** Design flight I and II of open well staircase for following data: [25]

Floor to floor height : 3.325m

Riser = 175 mm, Tread = 250 mm,

No. of risers:

Flight I : 7 nos.

Flight II: 5 nos.

Flight III: 7 nos.

Material M20 & Fe 500.

Refer the centerline structural plan given in Figure 1, Width of all beams is 230mm. Draw the reinforcement details in sectional elevation for both flights.

## SECTION - II

**Q5)** Design a continuous beam ABCD for flexure and shear using IS Code coefficients. AB = BC = CD = 4.2m. The beam supports 120mm slab on both sides. The beam carries dead load of 20 kN/m (including its self-weight) and live load of 10 kN/m. Take material M30 and Fe500. Show the reinforcement detail in longitudinal section and cross-section at continuous support and at mid span. [25]

OR

**Q6)** A continuous R.C.C. floor beam B3 - B4 (Refer Fig.1) is simply supported at end supports and continuous through column C9. Consider live load on slab  $2\text{kN/m}^2$  and floor finish  $1.5\text{ kN/m}^2$ . Assume slab thickness  $130\text{ mm}$  for load calculation. Consider  $230\text{ mm}$  thick brick wall on all exterior beams. Floor to floor height is  $3.23\text{m}$ . Show detailed load calculations and determine support moments, maximum span moments for all beams, using  $20\%$  redistribution of moments. Draw bending moment diagram and design the beam only for flexure. Show the reinforcement details along the length of beam with suitable cross sections. **[25]**

Material - Concrete of grade M25, Fe 500 reinforcement.

**Q7)** A centerline plan of a G + 2 building is shown in figure 1. Design an axially loaded short column C10 for ground floor only. Also design isolated footing for column C10. Use following details: **[25]**

- a) Floor to Floor height =  $3.5\text{m}$
- b) Height of column below plinth =  $2.1\text{m}$
- c) Live load on all slabs =  $3\text{ kN/m}^2$
- d) Floor Finish Load =  $1.2\text{ kN/m}^2$
- e) Water Proofing Load on roof slab =  $1.5\text{ kN/m}^2$
- f) Wall thickness =  $120\text{ mm}$  (Internal)
- g) Slab thickness =  $125\text{ mm}$
- h) Size of beams =  $230 \times 450\text{ mm}$
- i) Safe bearing capacity of soil =  $230\text{ kN/m}^2$

Material M 25 and Fe 415 used. Show detailed load and design calculations.

OR

**Q8)** Design a bi-axial short column by limit state method with material M20 and Fe 500 to carry a working load of  $1050\text{ kN}$ . Working moment of  $80\text{ kN-m}$  about major axis bisecting the depth of column and  $25\text{ kN-m}$  about minor axis bisecting the width of column. The unsupported length of column is  $4.2\text{m}$ . The column is fixed at both ends. Also design the footing for this column considering axial load and moment about major axis only. Take  $\text{SBC} = 280\text{ kN/m}^2$ . Show detailed design calculations and reinforcement details in plan and sectional elevation. **[25]**

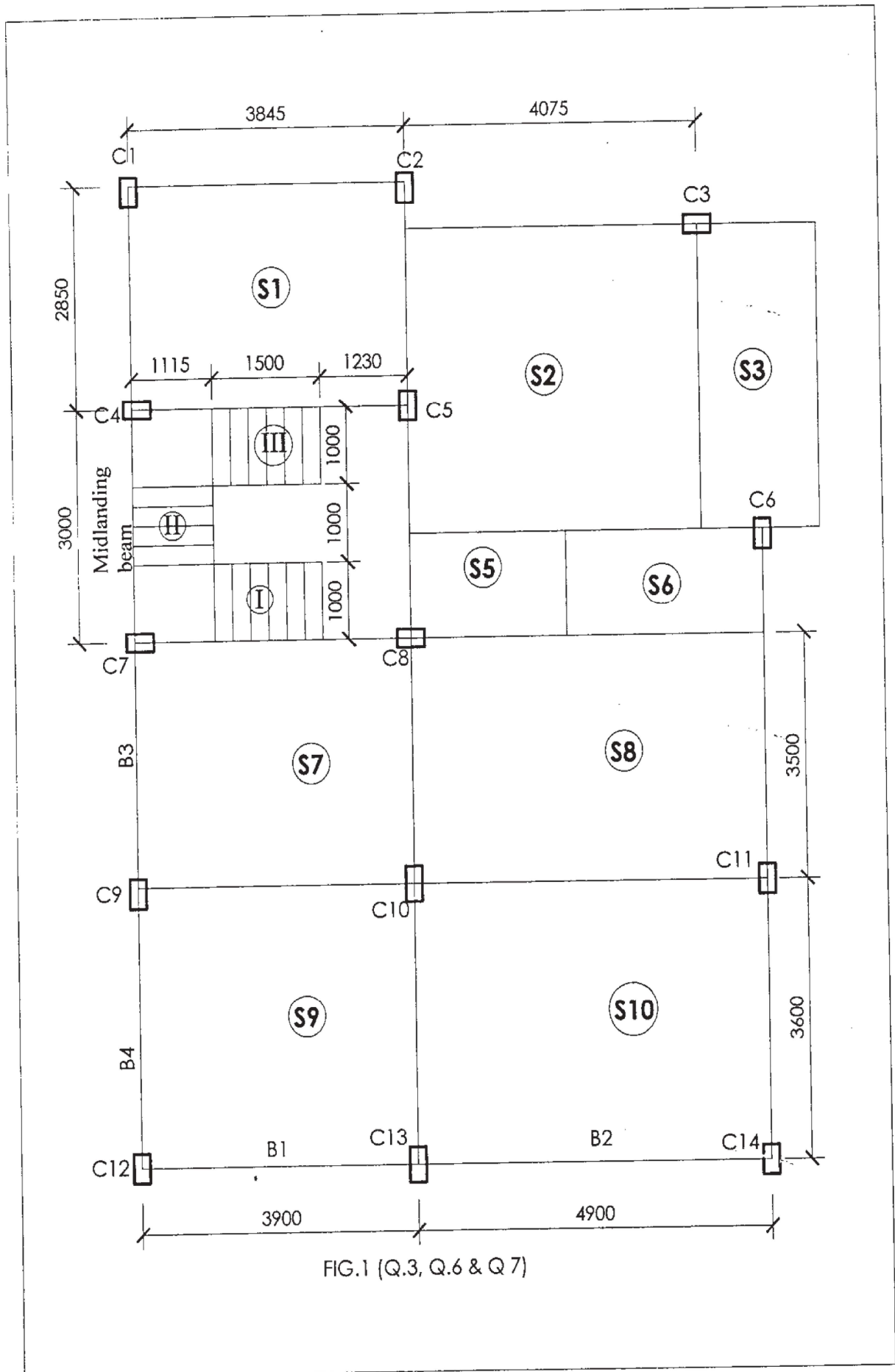


FIG.1 (Q.3, Q.6 & Q 7)

Chart - 13 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.

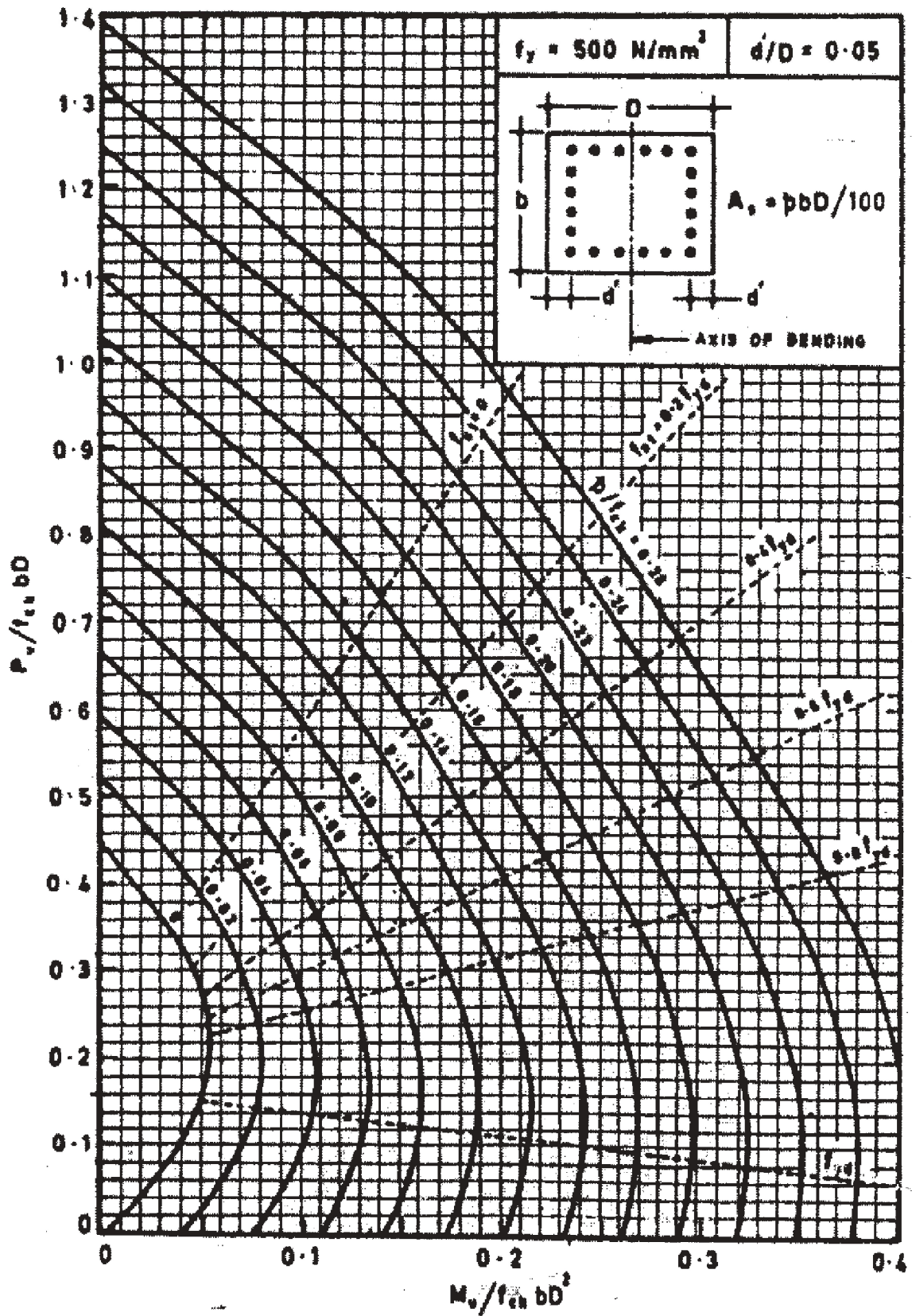


Chart - 14 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.

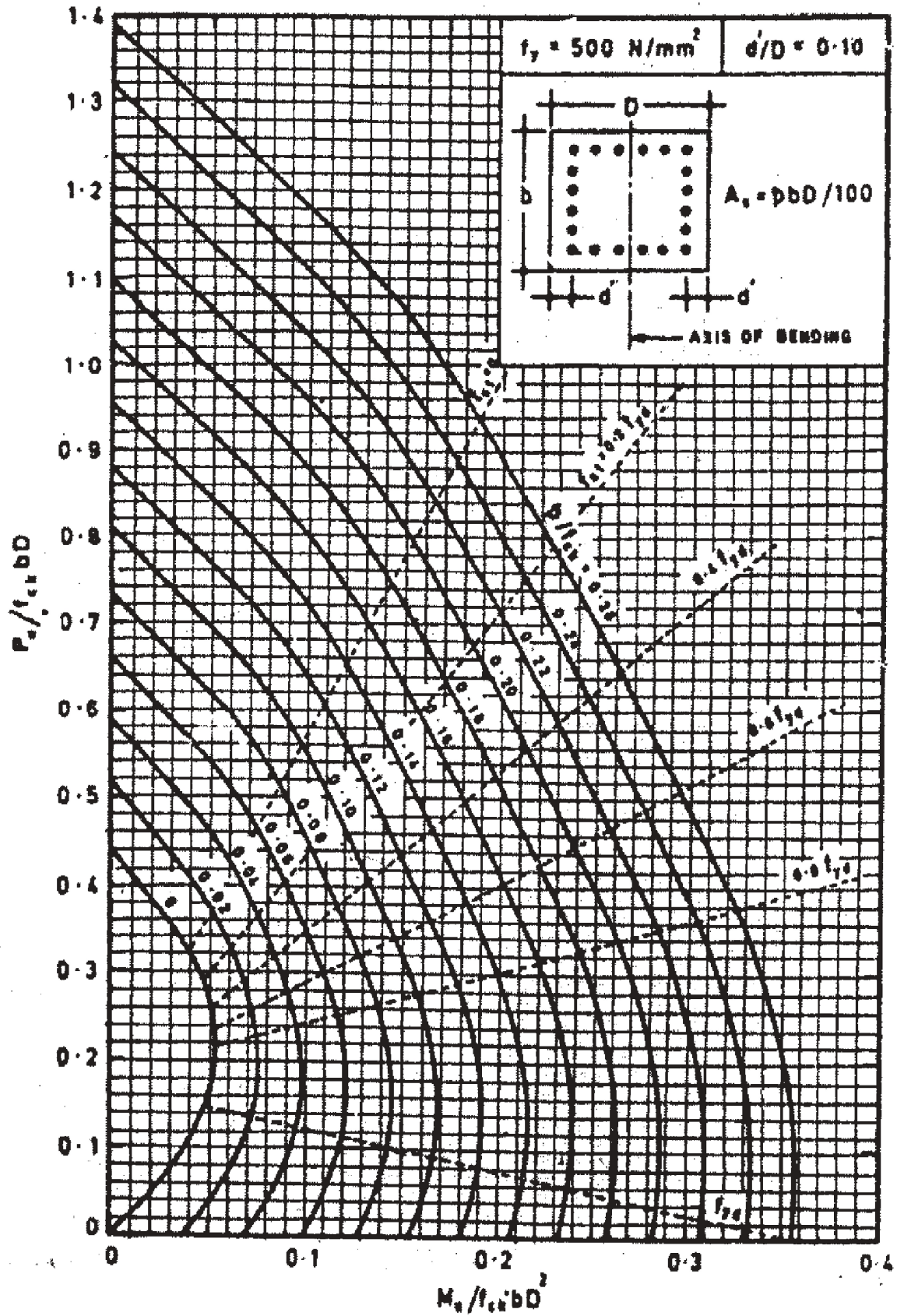


Chart - 15 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.

