

Total No. of Questions : 12]

SEAT No. :

P5566

[Total No. of Pages : 8

[5560] - 509

**T.E. (Civil) (Semester - II)**  
**STRUCTURAL DESIGN - II**  
**(2015 Pattern)**

*Time : 3 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, Q.7 or Q.8, Q.9 or Q.10 and Q.11 or Q.12.
- 2) Figures to the right indicate full marks.
- 3) IS-456-2000 and non programmable calculator are allowed in the examination.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Mere reproduction from IS Code as answer, will not be given full credit.
- 6) If necessary assume suitable data and indicate clearly.

**Q1)** Explain with neat sketch Balanced, Under reinforced and Over reinforced section as per LSM. [5]

OR

**Q2)** Explain the terms bond stress and development length. Calculate development length for 20mm diameter bar in compression and tension by LSM approach. Use M25 concrete and Fe 500 steel. [5]

**Q3)** A reinforced concrete rectangular beam has width 230mm and total depth 600mm with effective cover of 25mm. The beam is reinforced with 3 bars with 20mm diameter at support section at tension side. Calculate the shear strength of the support section if 8mm diameter two legged stirrups are provided at spacing 200mm C/C. Use M20 grade of concrete and Fe 415 grade of steel. Use LSM. [7]

OR

**Q4)** A rectangular beam section, 230mm wide and 600mm depth is reinforced with 4 bars of 20mm diameter in the tensile zone and 2 bars of 16mm in the compression zone. The effective cover is 30mm for both the reinforcement. Determine moment of resistance of the section using WSM. Use M 25 grade of concrete and Fe 415 grade of steel. [7]

**P.T.O.**

**Q5)** A rectangular RC beam of size 300 mm x 750 mm with effective cover 40 mm is subjected to following actions : **[8]**

- I. Factored BM = 120 kN.m
- II. Factored SF = 80 kN
- III. Factored Torsional Moment = 30 kN.m

Design the beam for flexure and shear using M 25 & Fe 500 grade materials.

OR

**Q6)** Figure 1 shows the layout of a typical floor for an office building. The live load and floor finish are  $3.0 \text{ kN/m}^2$  and  $1.5 \text{ kN/m}^2$ , respectively. Design slab panel  $S_1$  using LSM approach (Only for Flexure). The grade of concrete is M20 and steel is Fe 500. Show details of reinforcement. **[8]**

**Q7) a)** Explain different parameters of interaction curves for the design of columns. **[4]**

**b)** Design flight I and II of open well staircase as shown in Fig. 1, for following data : **[12]**

Riser = 150mm, Tread = 250mm,

Floor to floor height is 3.3 m,

Width of Stair and landing = 1200 mm.

Material M25 & Fe500, Width of all beams is 230mm.

Draw the reinforcement details in sectional elevation for both flights.

OR

**Q8)** Design continuous one way slab of four span-S6-S7-S8-S9 as shown in Fig.1. The slabs are supported by beams of width 230mm along all the edges. The slab is subjected to floor finish of  $1.5 \text{ kN/m}^2$  and live load  $3 \text{ kN/m}^2$ . Use Concrete of grade M25 and Fe 500 reinforcement for moderate exposure condition. Draw details of reinforcement. **[16]**

**Q9)** A continuous R.C.C. floor beam B30-B31 (Refer Fig. 1) is simply supported at end supports and continuous through column C9. Consider live load on slab  $3\text{ kN/m}^2$  and floor finish  $1.5\text{ kN/m}^2$ . Assume slab thickness  $130\text{ mm}$  for load calculation. Consider load of  $150\text{ mm}$  thick brick wall of height  $3\text{ m}$  on both the beams. 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 by LSM**. Show the reinforcement details along the length of beam with suitable cross sections.

Material-Concrete of grade M20, Fe 500 reinforcement. [16]

OR

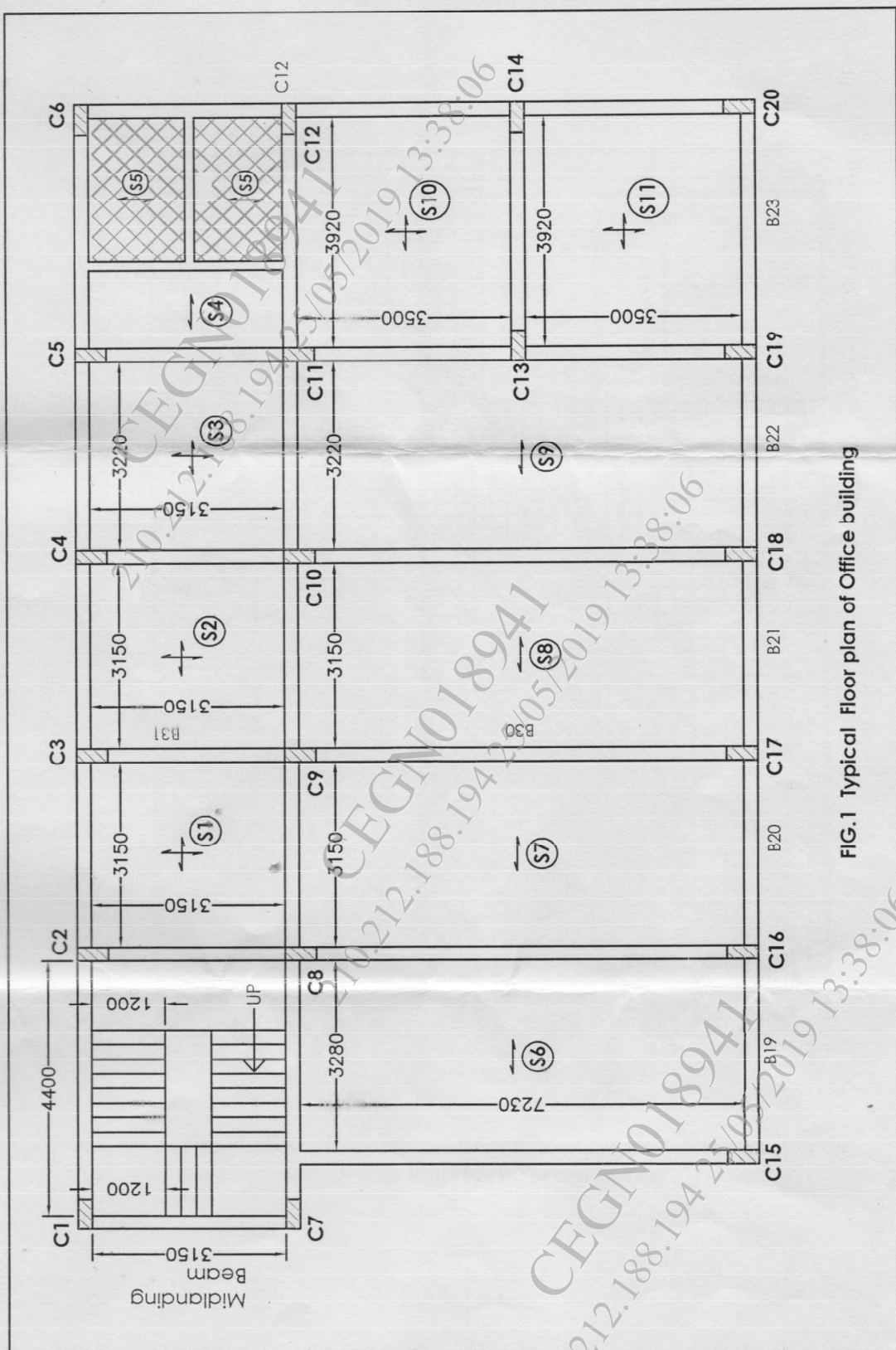
**Q10)** Using IS code coefficients design a continuous beam B19-B20-B21-B22 of a typical floor for an office building shown in figure 1. All slab panels are  $130\text{ mm}$  thick. The live load and floor finish for slabs are  $3.0\text{ kN/m}^2$  and  $1.5\text{ kN/m}^2$ , respectively. This continuous beam also supports  $230\text{ mm}$  thick brick masonry wall of  $3\text{ m}$  height. Use LSM approach. Show details of tension as well as shear reinforcement. Use M25 grade of concrete and Fe 500 steel. [16]

**Q11) a)** Design a bi-axial short column by limit state method with material M25 and Fe 500 to carry Ultimate load of  $1800\text{ kN}$ . Factored moment of  $120\text{ kN-m}$  about major axis bisecting the depth of column and  $45\text{ kN-m}$  about minor axis bisecting the width of column. The unsupported length of column is  $3.6\text{ m}$ . The column is fixed at one end and hinged at the other. Show details of reinforcement in plan and sectional elevation. [14]

b) State the functions of longitudinal and transverse reinforcement in columns. [4]

OR

**Q12)** Design a short axially loaded column and its isolated footing for carrying a working axial load of  $1000\text{ kN}$ . The effective length of column is  $3.2\text{ m}$ . Use M25 grade of concrete and Fe 500 grade of steel. SBC of soil is  $230\text{ kN/m}^2$ . [18]



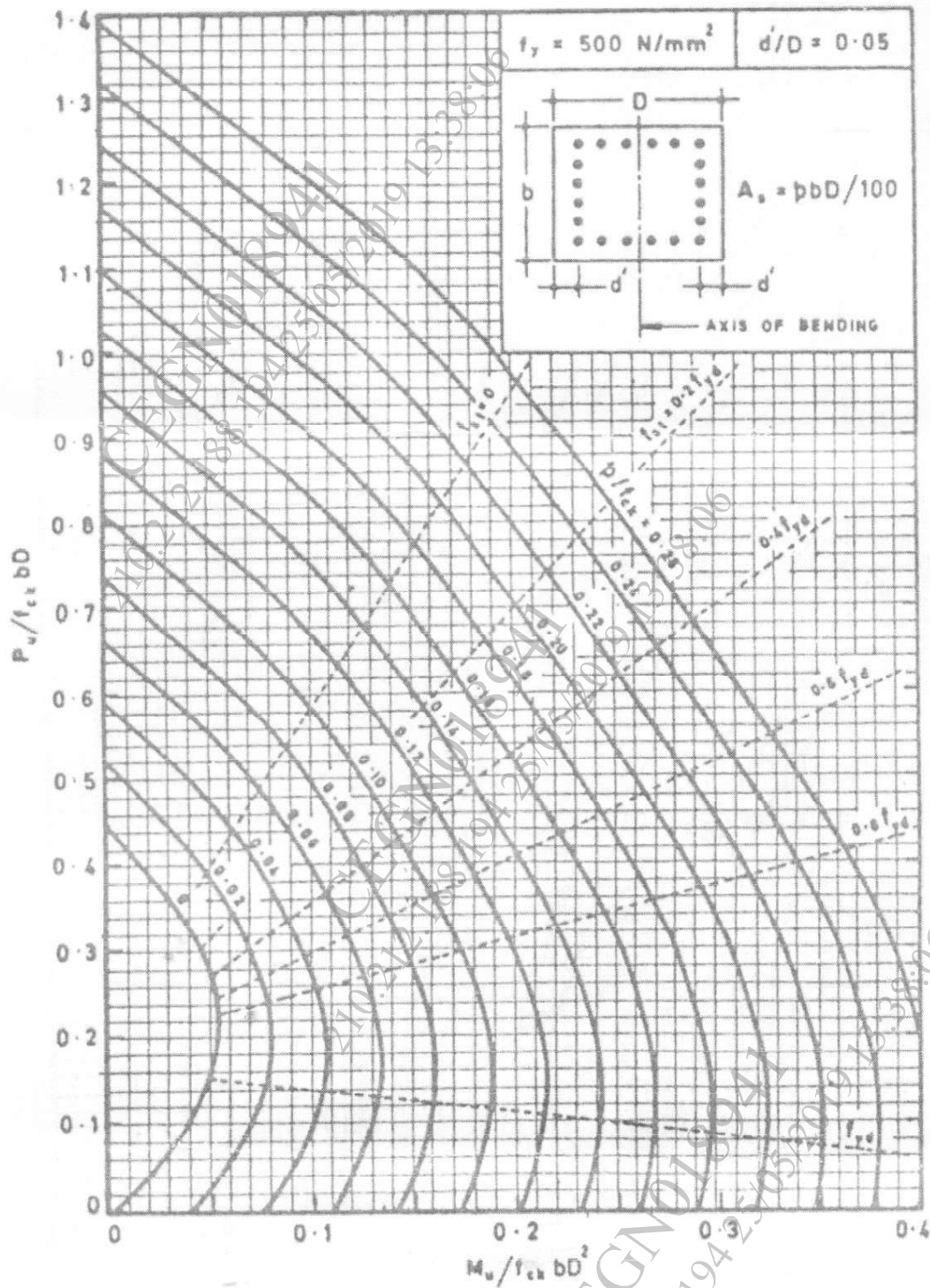


Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

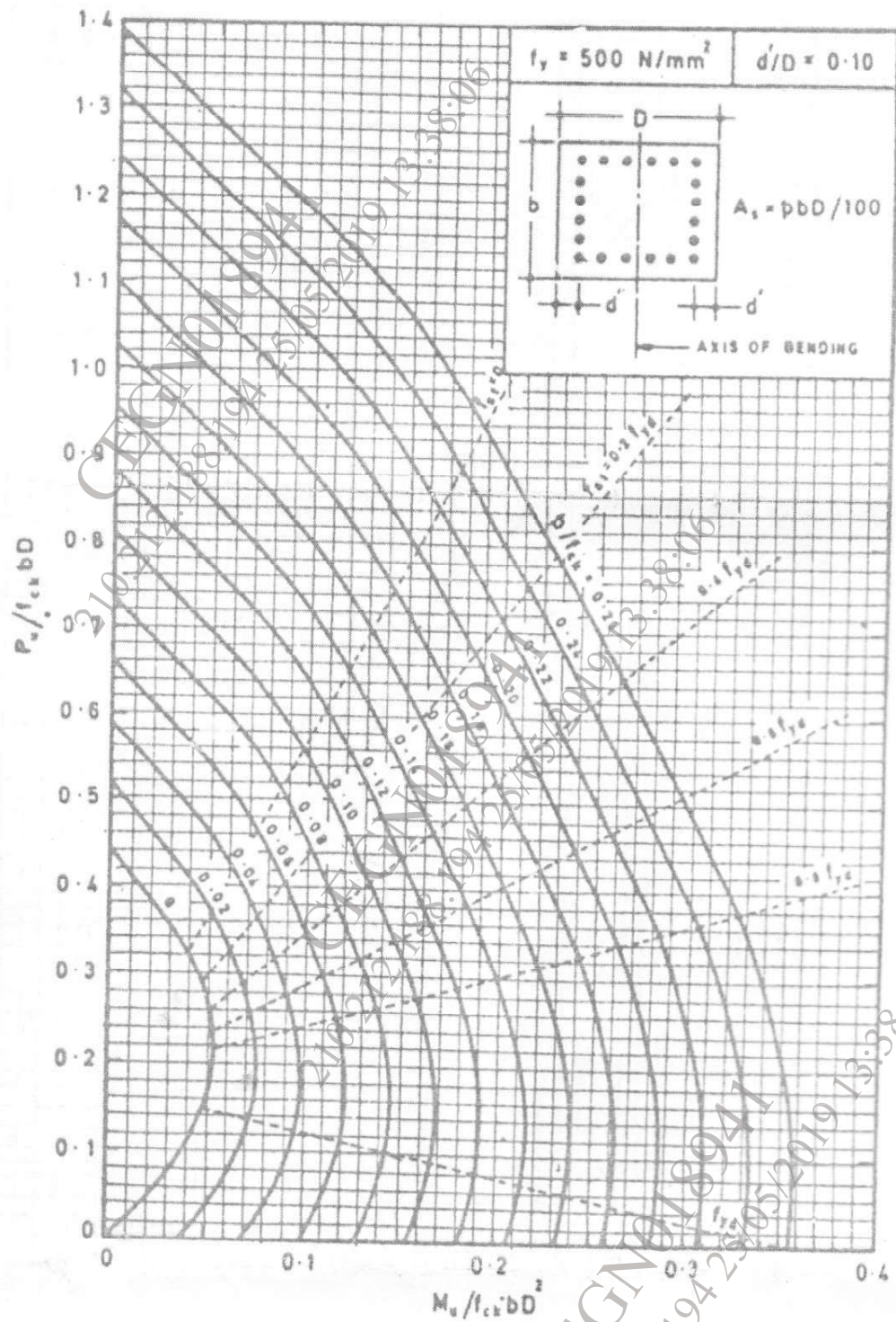


Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides



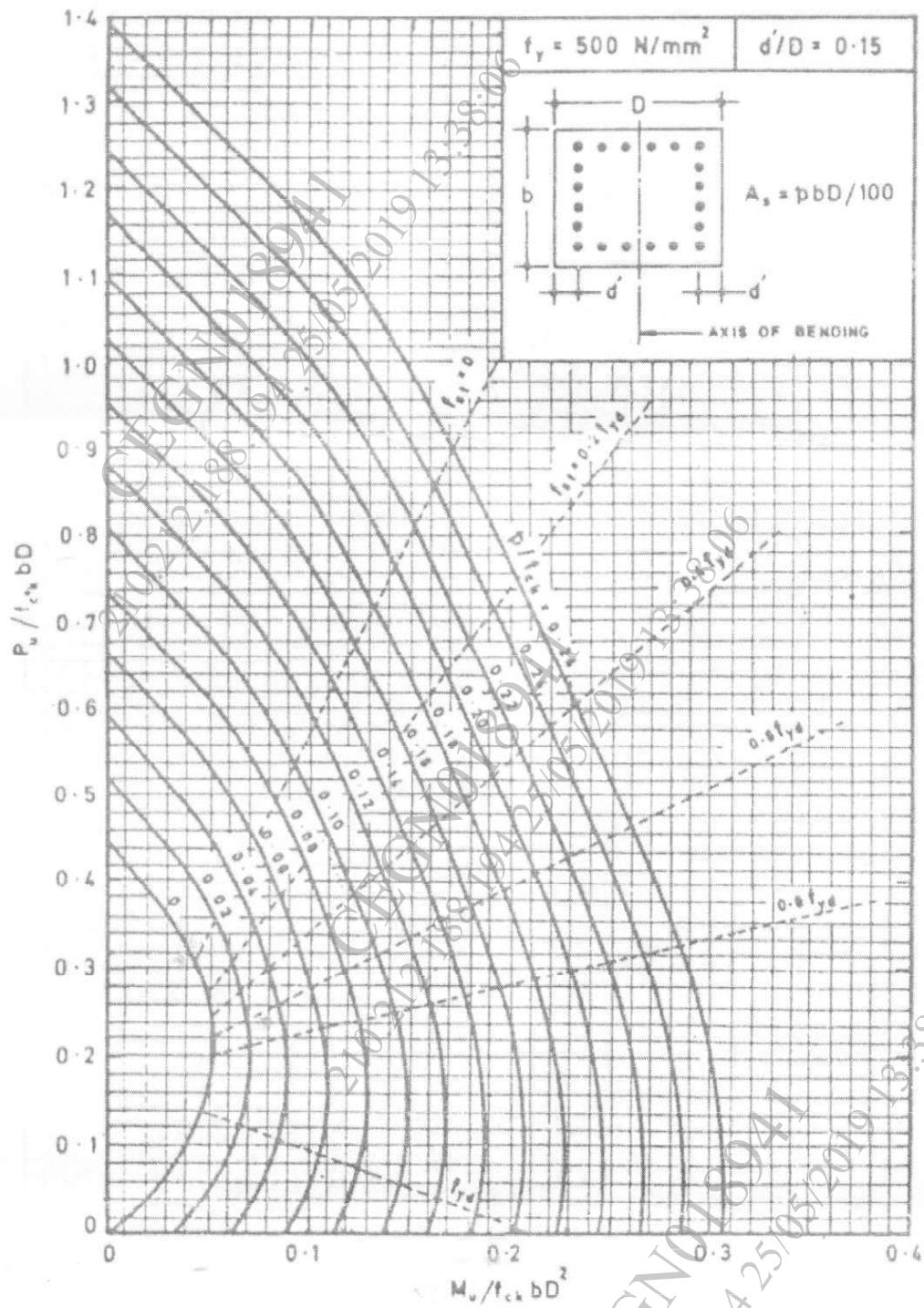


Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

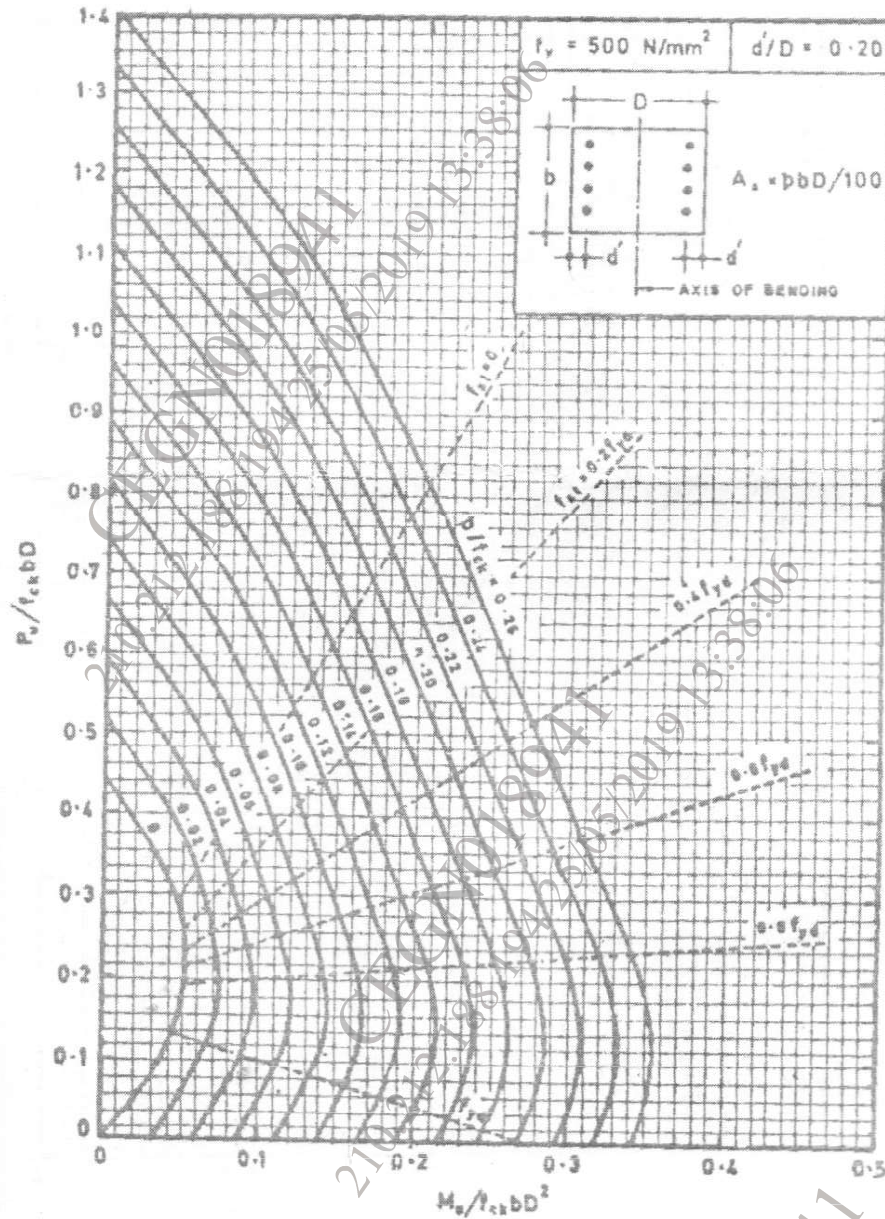


Chart No 4: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

