Total No. of Questions : 8]

SEAT No. : [ ]

PA-1433

[Total No. of Pages : 7

[5926]-49

T.E. (Civil)

DESIGN OF RC 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, Q.7 or Q.8***
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) a) Design any intermediate flight of a dog legged staircase of a residential building as shown in Figure 1 with the following data: **[13]**

i) Floor to floor height = 3.15m

ii) Rise = 175mm; Tread = 250mm; Width of flight = 1.0m

iii) Width of supporting beams = 230mm

iv) Live load = 3.0 kN/m^2, Floor finish = 0.75 kN/m^2

v) Material = M30, Fe 500

vi) Draw details of reinforcement. Use LSM approach.

b) What do you meant by doubly reinforced section? Under which circumstances doubly reinforced sections are needed. Explain check for deflection for doubly reinforced section. **[5]**

OR

P.T.O.

Q2) Design a simply supported reinforced concrete floor beam B12 as shown in Figure 1 with following data: **[18]**

i) Center to center Span of beam = 3.73 m

ii) Width of supporting columns = 300mm

iii) Beam width = 230 mm

iv) The beam supports two way slab of thickness 120mm on both sides of beam

v) Live load = 3kN/m^2; Floor finish= 1.5 kN/m^2

vi) The wall on this beam is 150 mm thick and 2.7 m high.

vii) Material - M25, Fe 415

viii) Show details of reinforcement. Use LSM

Q3) Design a continuous floor beam B8-B9-B10 as shown in Figure 1 using IS code coefficients (or moment distribution). Thickness of the all floor slab is 120 mm, live load and floor finish load on all slabs are 2.5 kN/m^2 and 1.5 kN/m^2, respectively. The wall on this beam is 230 mm thick and 2.7 m high. Use M 25 and Fe 500 steel. Design longitudinal reinforcement for all the spans and support for flexure. Design shear reinforcement only for beam B19. Draw neat sketch showing details of main and shear reinforcement. Use LSM. **[17]**

OR

Q4) Continuous RC beam ABCD of rectangular section is simply supported at A and D and continuous over support B and C. Span AB = 4.0m, BC = 6.0m and CD = 5.0m. The beam carries working dead load of 24 kN/m (including its self-weight) and working live load of 20 kN/m. The beam supports 120mm slab on one side. Calculate design moment for span BC and support C after 20 % redistribution of moments by considering proper load case. Design span BC and support C for flexure only. Draw the reinforcement details.

Material- Concrete of grade M30, Fe 500 reinforcement. **[17]**

Q5) Design an axially loaded short column C10 as shown in Figure 1 from terrace to footing level (floor wise four parts of column) for a G + 2 building with following details: **[18]**

i) Floor to Floor height = 3.6 m, consider both ends fixed.

ii) Height of column below plinth = 2.5 m

iii) Live load on all slabs = 4 kN/m^2

iv) Floor Finish Load = 1.5 kN/m^2

v) Water Proofing Load on roof slab = 1.5 kN/m^2

vi) Wall thickness = 150 mm (Internal)

vii) Slab thickness = 130 mm

viii) Size of beams = 230 × 450 mm

Material M 25 and Fe 500 used. Show detailed floorwise load & design calculations. Draw section of column showing reinforcement details for each floor.

OR

Q6) Design a bi-axial short column by limit state method with material M25 and Fe 500 to carry Ultimate load of 1400 kN. Factored moment of 90 kN-m about major axis bisecting the depth of column and 40 kN-m about minor axis bisecting the width of column. The unsupported length of column is 4.2m. The column is fixed at one end and hinged at the other. Show details of reinforcement in plan and sectional elevation. **[18]**

Q7) Design an isolated pad footing for a working axial load of 800 kN. The effective length of column is 3.2 m. Use M30 grade of concrete and Fe 500 grade of steel. SBC of soil is 200 kN/m^2. Show detailed design calculations and reinforcement details in plan and sectional elevation. **[17]**

OR

Q8) Design a slab type rectangular combined footing for two columns A and B subjected to working axial load 800 kN and 900 kN, respectively. Center to center to distance between two columns is 2.8m. Size of both the columns is 400 × 400mm. Safe bearing capacity of soil is 150kN/m^2. Use M30 concrete and Fe 500 steel. Neglect check for one way shear. Show reinforcement details in sectional elevation. **[17]**

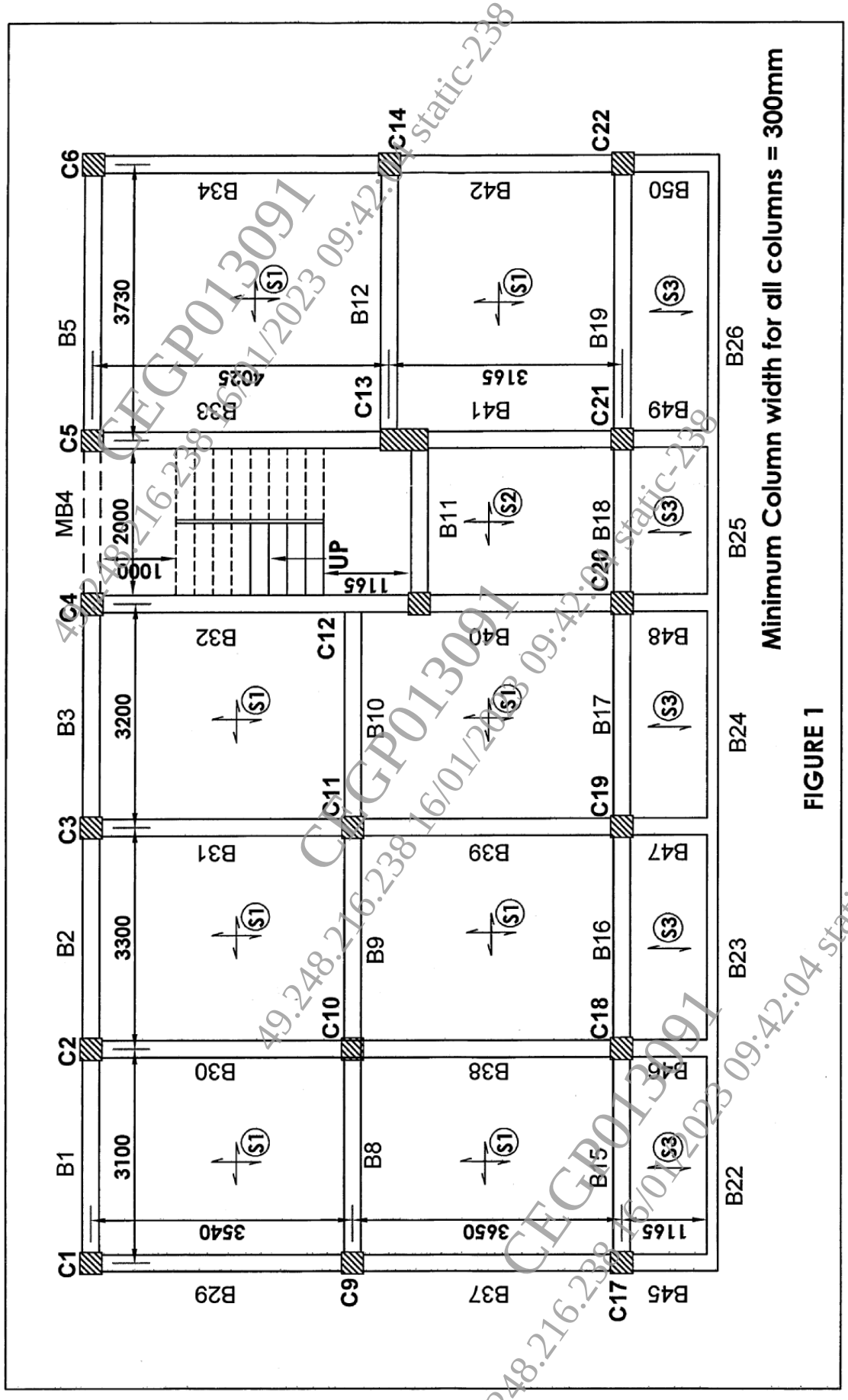

FIGURE 1

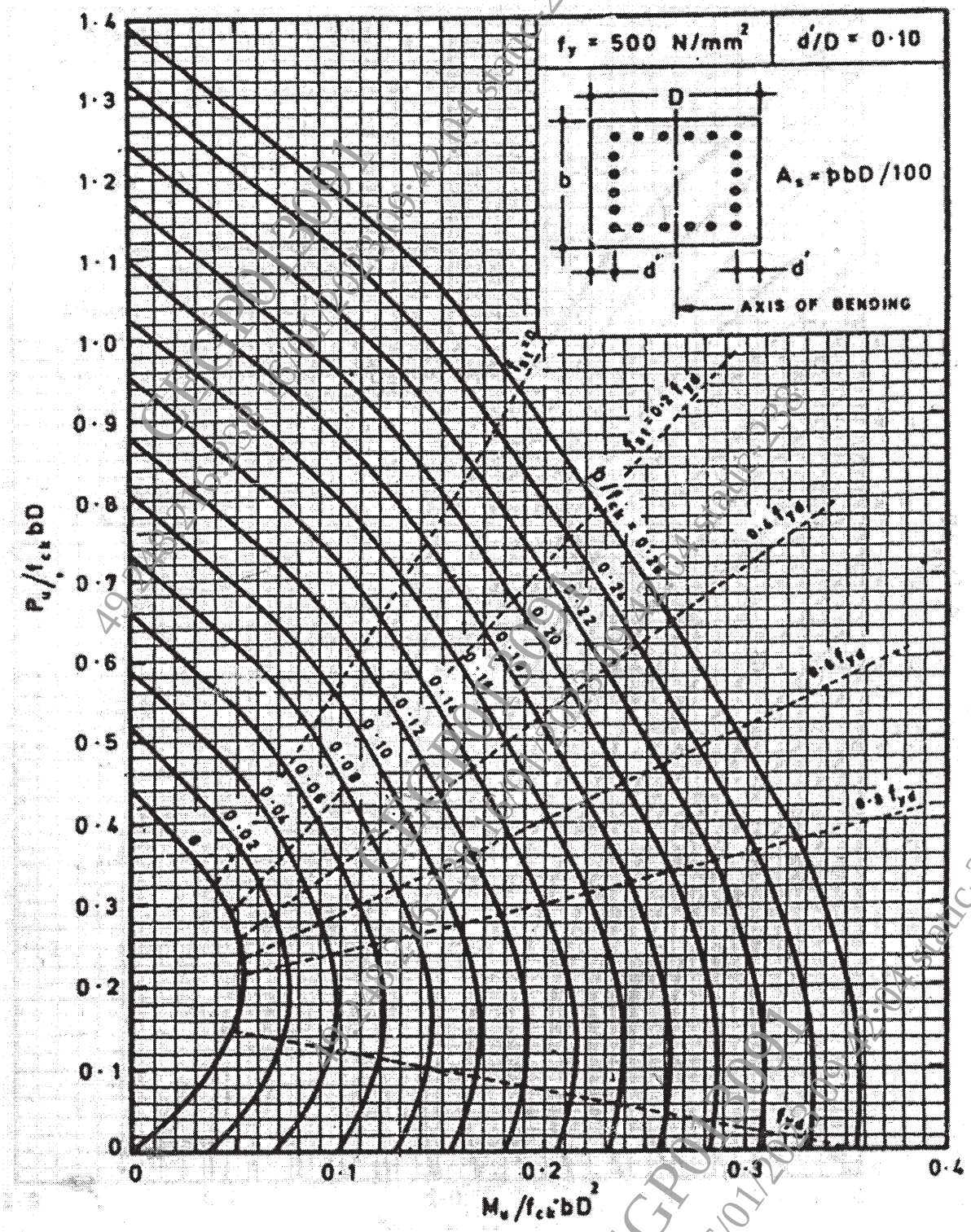

Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

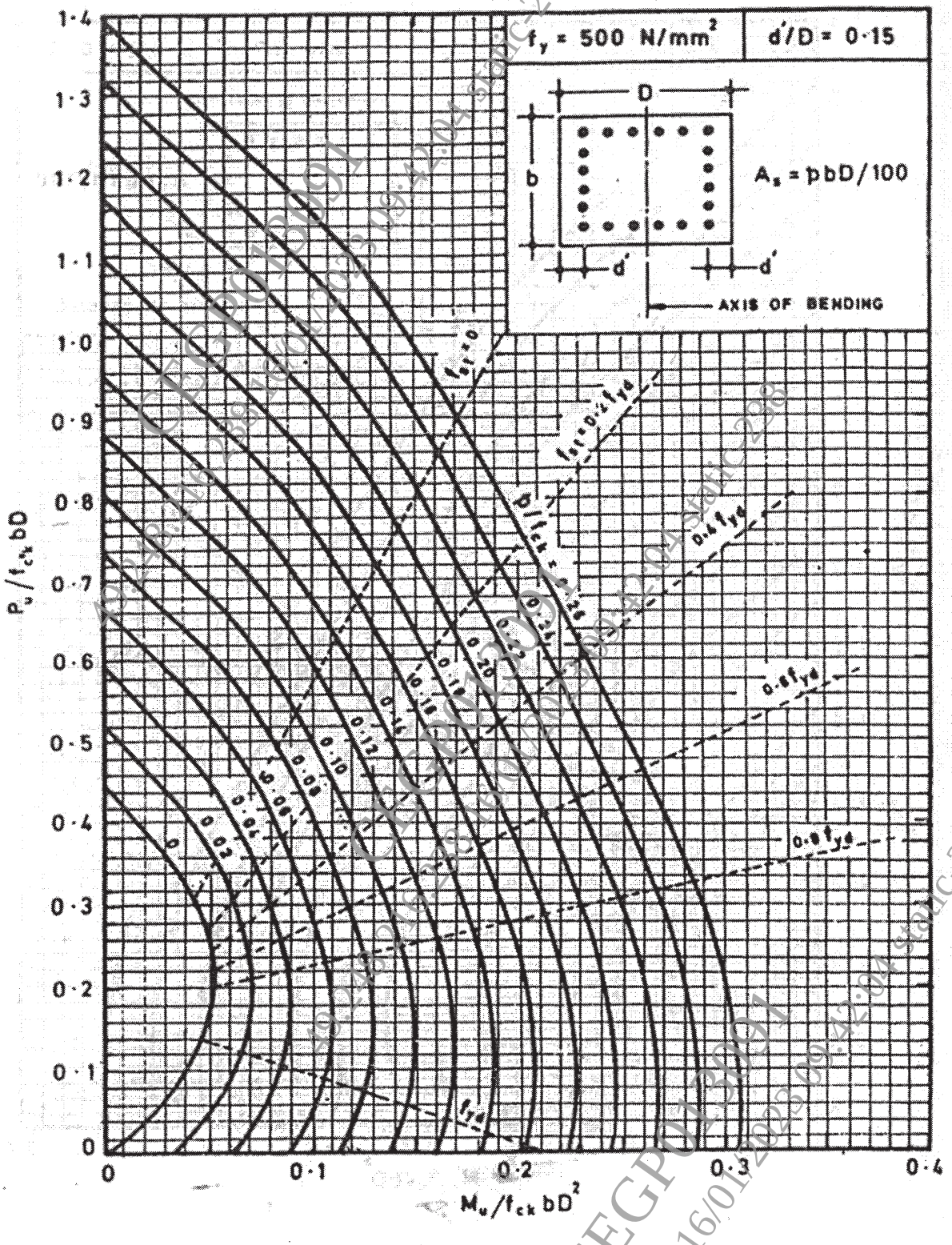

Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

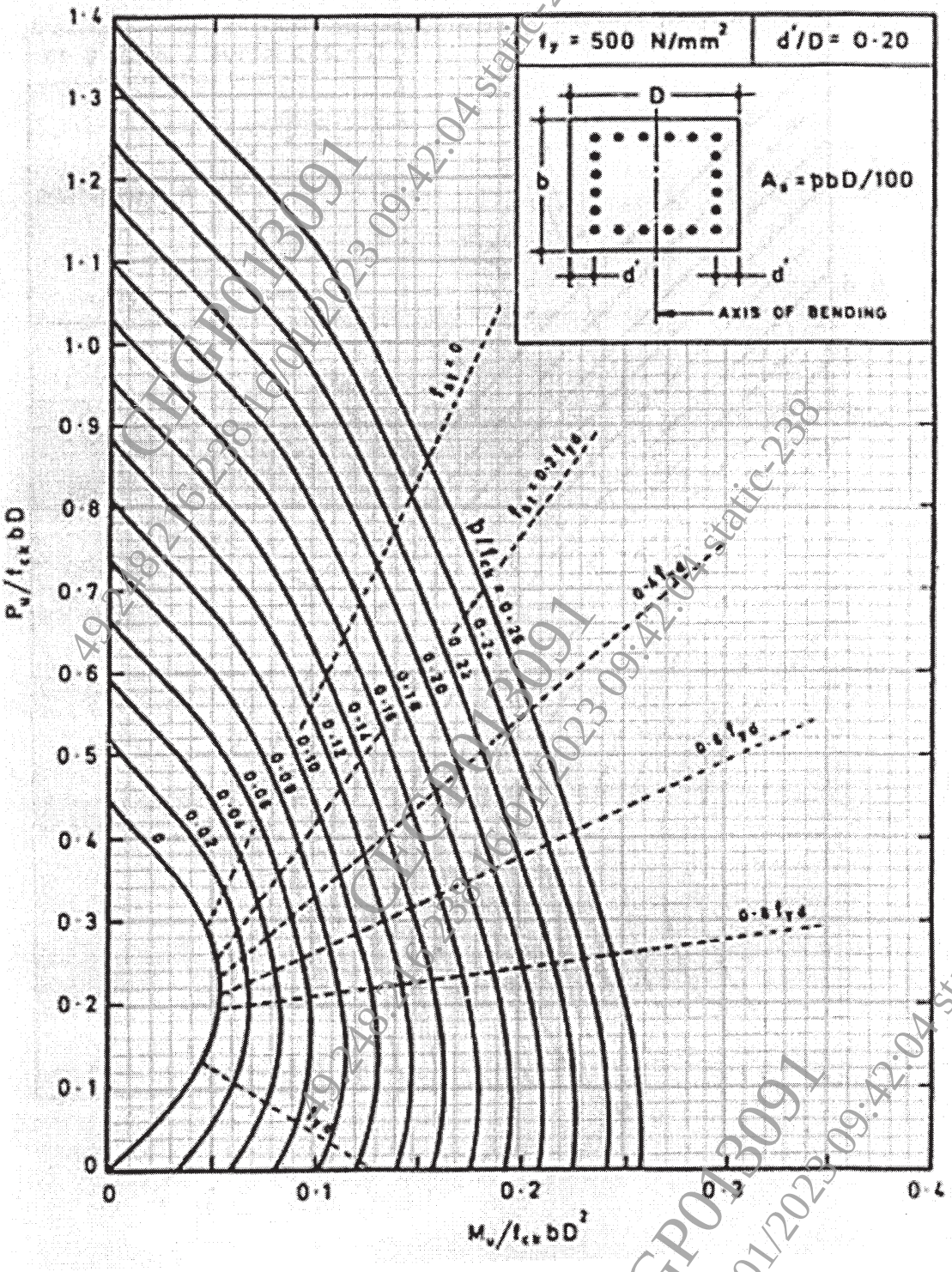

Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides