

Total No. of Questions : 8]

SEAT No. :

PE-2478

[Total No. of Pages : 7

[6583]-2

T.E. (Civil Engineering)

DESIGN OF RC STRUCTURES

(2019 Pattern) (Semester - VI) (301013)

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.
- 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 an 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) Tread = 250mm;
- iii) Width of supporting beams = 230mm
- iv) Live load = 3.0 kN/m² Floor finish = 0.75 kN/m²;
- v) Material = M25, Fe 415, Use LSM
- vi) Draw details of reinforcement of only one flight.

b) Explain in detail zoning of shear reinforcement. [5]

OR

Q2) a) Design a simply supported ground beam for the following data : [13]

- i) Center to center Span of beam = 5.5 m
- ii) Width of supporting columns = 300mm; Beam width = 230 mm
- iii) The beam supports 230mm thick brick wall.
- iv) Height of wall above plinth level = 2.7m, Plinth height = 1.2m.
- v) Material- M25, Fe 500

Show details of reinforcement. Use LSM

b) What are the advantages and limitations of using IS code coefficient method for the design of continuous beam. [5]

P.T.O.

Q3) Design a continuous floor beam B1-B2-B3 as shown in **Figure 1** using IS code coefficients. Thickness of the all floor slab is 120 mm, live load and floor finish load on all slabs are 3.0 kN/m² and 1.5 kN/m², respectively. The wall on this beam is 230 mm thick and 2.7 m high. Use M 30 and Fe 500 steel. Design longitudinal reinforcement for **all the spans** and **support** for **flexure**. Design shear reinforcement only for **beam B2**. Draw neat sketch showing details of main and shear reinforcement. Use LSM. [17]

OR

Q4) Design a continuous floor beam B17-B23 (A-B-C) as shown in **Figure 1** using moment redistribution method. Thickness of the all floor slab is 120 mm, live load and floor finish load on all slabs are 3.0 kN/m² and 1.5 kN/m², respectively. The wall on this beam is 120 mm thick and 2.7 m high. Calculate design moment for **span BC and support B** after 20 % redistribution of moments. Design span BC and support B for **flexure only**. Draw the reinforcement details.

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

Q5) a) Design an axially loaded short column C9 as shown in Figure 1 from terrace to plinth level (floor wise four parts of column) for a G + 2 building with following details: [13]

- i) Floor to Floor height = 3.6 m, consider both ends fixed.
- ii) Live load on all slabs = 3 kN/m²
- iii) Floor Finish Load = 1.5 kN/m²
- iv) Water Proofing Load on roof slab = 1.5 kN/m²
- v) Wall thickness = 150 mm (Internal)
- vi) Slab thickness = 130 mm
- vii) Size of beams = 230 × 450 mm

Material M 25 and Fe 500 used. Show detailed floorwise load calculations and design the column from plinth level to first floor level. Draw section of column showing reinforcement details.

b) What are interaction curves? Explain the characteristic of a typical interaction curve. [4]

OR

Q6) Design a bi-axial short column by limit state method to carry Ultimate load of 1500 kN. Ultimate moment of 110 kN-m about major axis bisecting the depth of column and 50 kN-m about minor axis bisecting the width of column. The unsupported length of column is 4.5m. The column is fixed at one end and hinged at the other. Use M25 grade of concrete and Fe 500 grade of steel. Show details of reinforcement in plan and sectional elevation. [17]

Q7) Design rectangular isolated pad footing for a working axial load of 800 kN. The column size is 300 × 450mm. SBC of soil is 200 kN/m². Use M30 grade of concrete and Fe 500 grade of steel. Show detailed design calculations and reinforcement details in plan and sectional elevation. [18]

OR

Q8) Design a slab type rectangular combined footing for two columns A and B subjected to working axial load 750 kN and 850 kN, respectively. Center to center to distance between two columns is 2.4m. Size of both the columns is 400 × 400mm. Safe bearing capacity of soil is 160kN/m². Use M30 concrete and Fe500 steel. Neglect check for one way shear. Show reinforcement details in sectional elevation. [18]

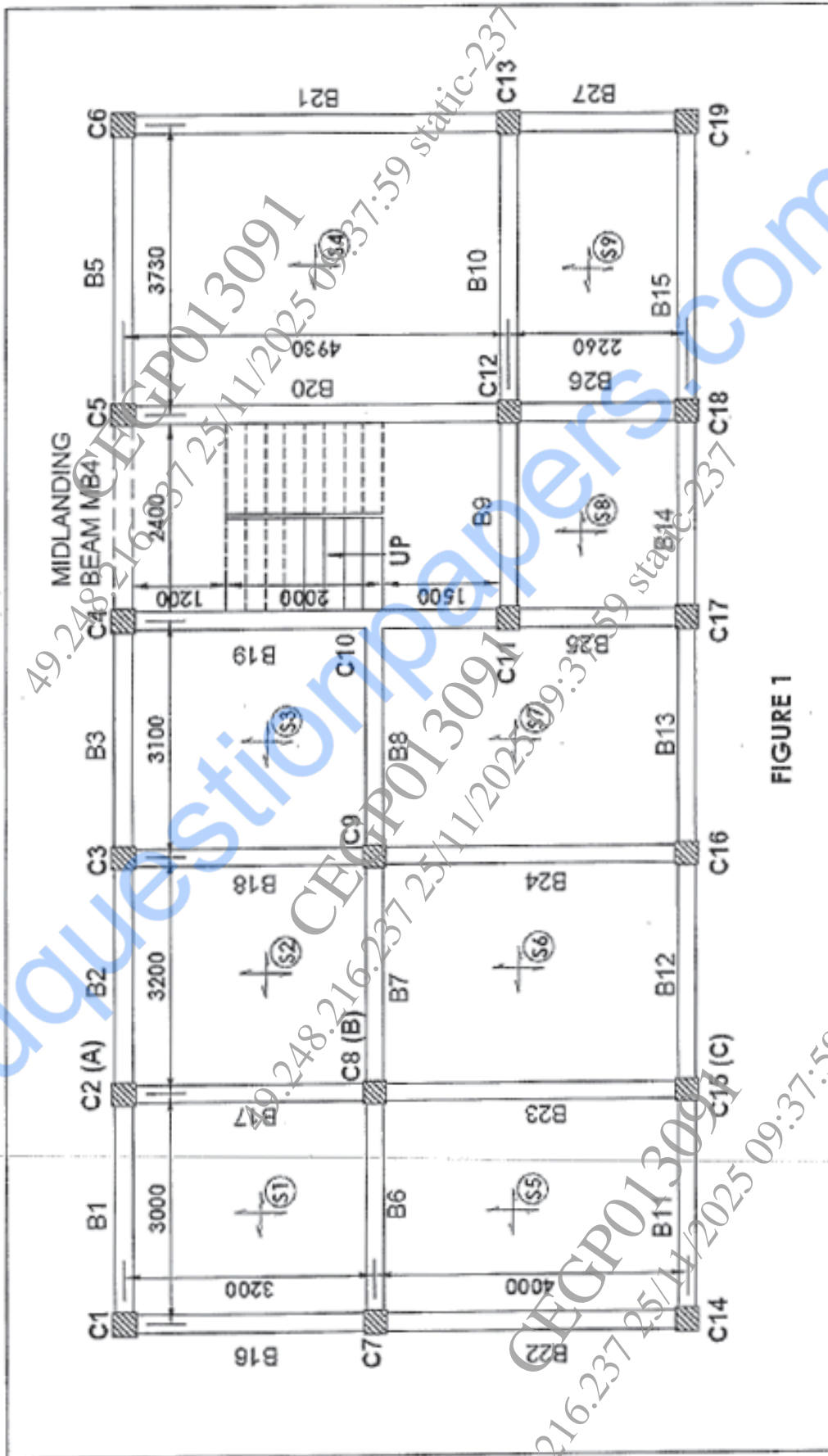


FIGURE 1

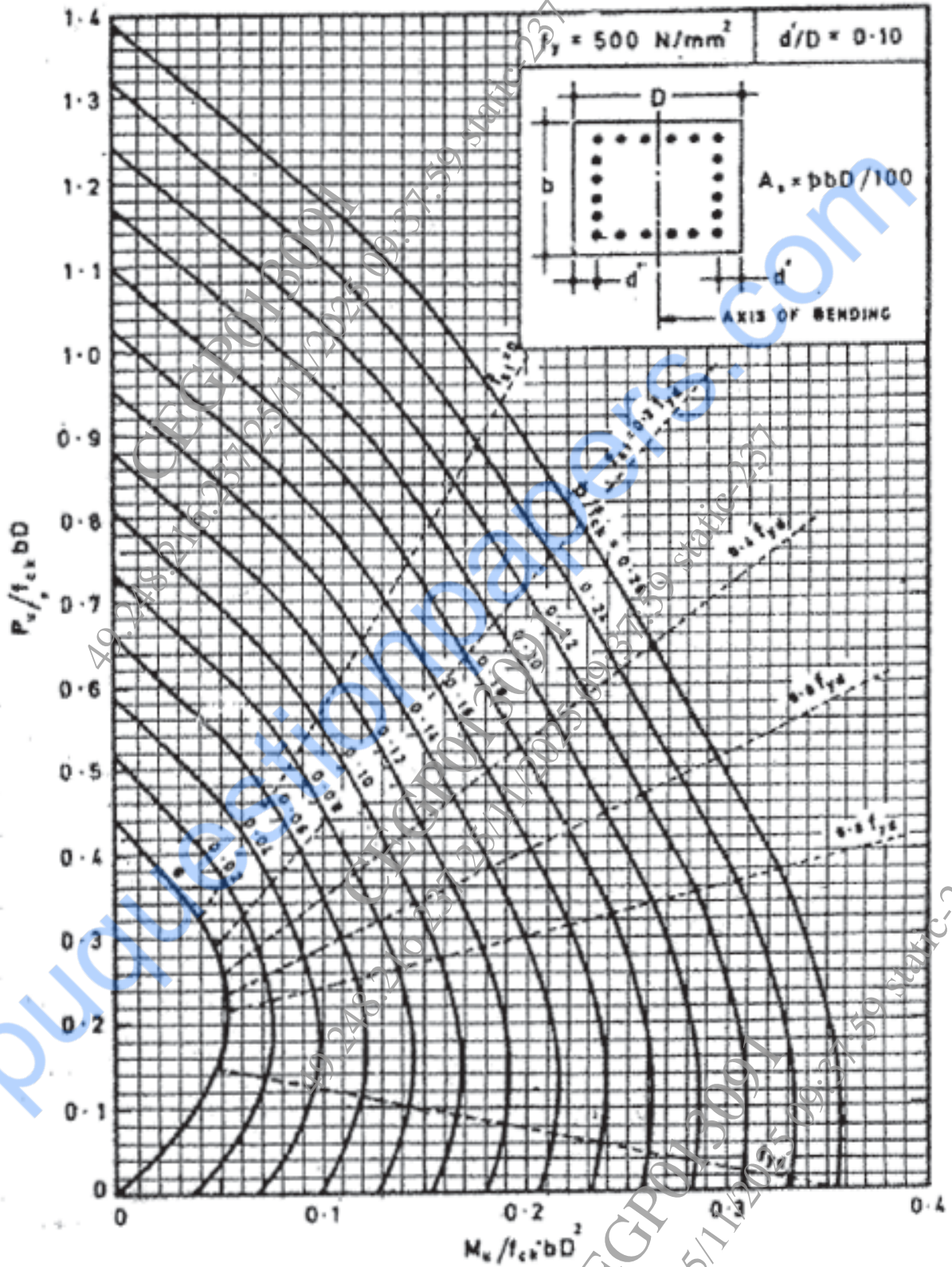


Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

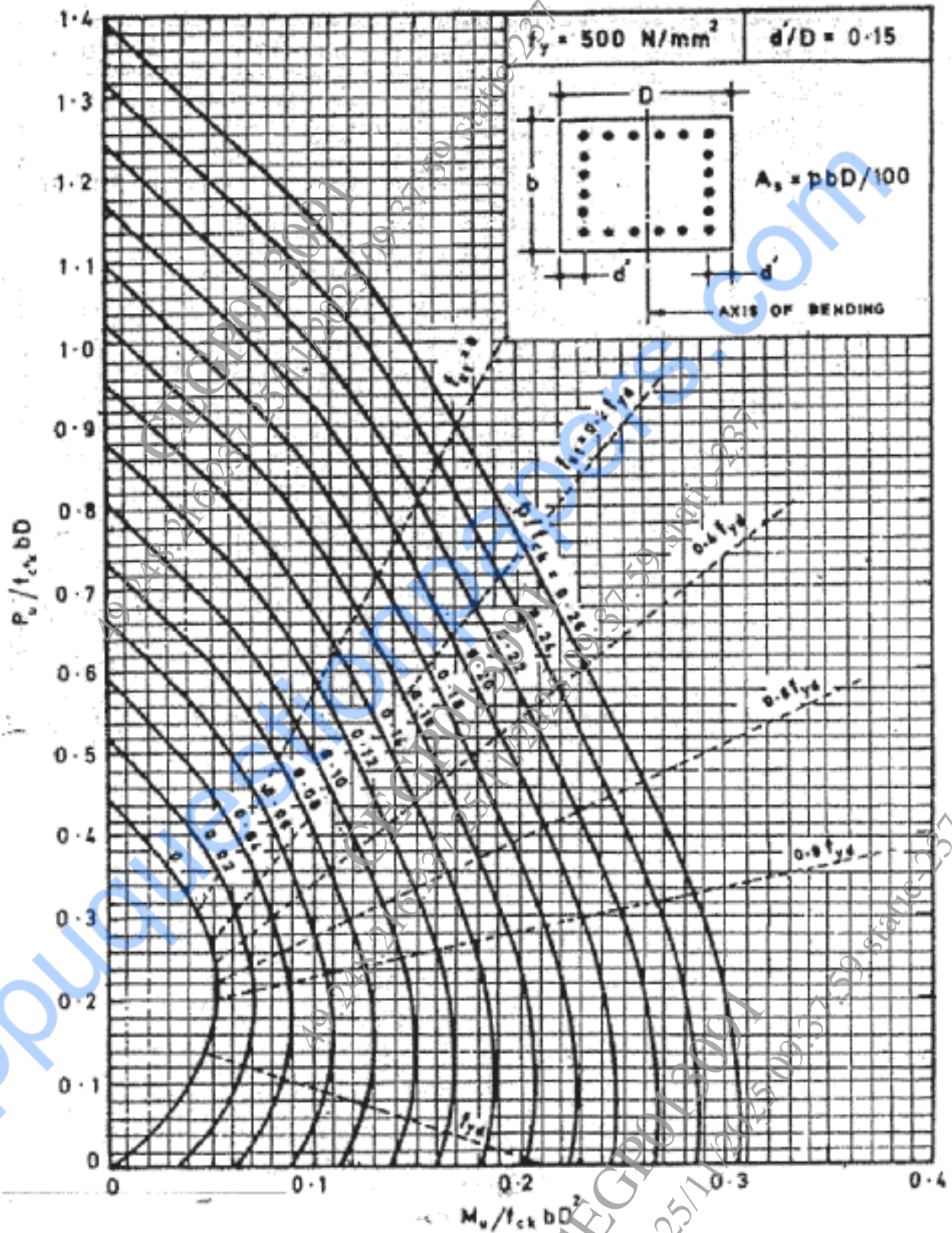


Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

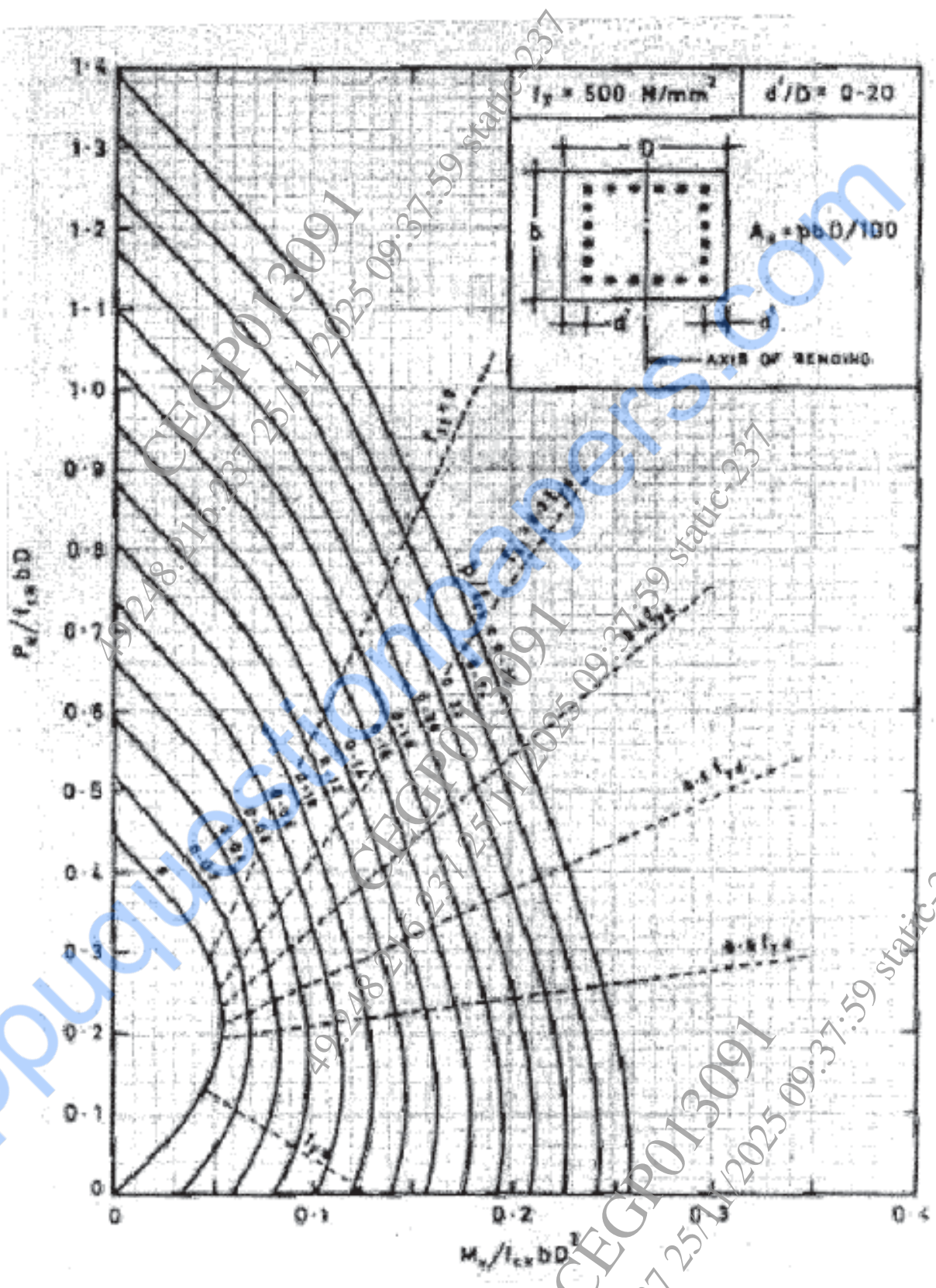


Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides