Total No. of Questions : 8]

SEAT No. :

PD4218

[Total No. of Pages : 6

[6403]-12

T.E. (Civil)

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 = 4.0 kN/m^2; Floor finish= 0.75 kN/m^2

v) Material = M25, Fe 500, Use LSM

vi) Draw details of reinforcement of only one flight.

b) What is Redistribution of moments and what are advantages of it? **[5]**

OR

Q2) Design a simply supported reinforced concrete floor beam B10 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 slab of thickness 120mm on both side of beam

v) For slab-Live load = 2kN/m^2; Floor finish = 1.0 kN/m^2

vi) The wall on this beam is 120 mm thick and 2.7 m high.

vii) Material- M25, Fe 500.

Show details of reinforcement along with zoning of shear reinforcement. UseLSM

P.T.O.

Q3) Design a continuous floor beam B11-B12-B13 as shown in Figure 1 using IS code coefficients. Thickness of the all floor slab is 130 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 2.6 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 B12. 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 130 mm, live load and floor finish load on all slabs are 3.0 kN/m^2 and 1.5 kN/m^2, respectively. The wall on this beam is 120 mm thick and 2.7 m high. Calculate design moment for span AB and support B after 22 % 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 a uni-axial short column by limit state method with material M25 and Fe 500 to carry a working load of 900 kN, working moment of 80 kN-m about major axis bisecting the depth of column. The unsupported length of column is 4.2m. The column is fixed at one end and hinged at the other. Show detailed design calculations and reinforcement details. **[13]**

b) Explain the role of longitudinal and transverse reinforcement of column. **[4]**

OR

Q6) Design a bi-axial short column by limit state method to carry Ultimate load of 1200 kN. Ultimate moment of 100 kN-m about major axis bisecting the depth of column and 20 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. 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 an ultimate working axial load of 1500 kN. The column size is 300 × 450mm. SBC of soil is 250 kN/m^2. 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 1000 kN and 1050 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 180 kN/m^2. Use M30 concrete and Fe500 steel. Neglect check for one way shear. Show reinforcement details in sectional elevation. **[18]**

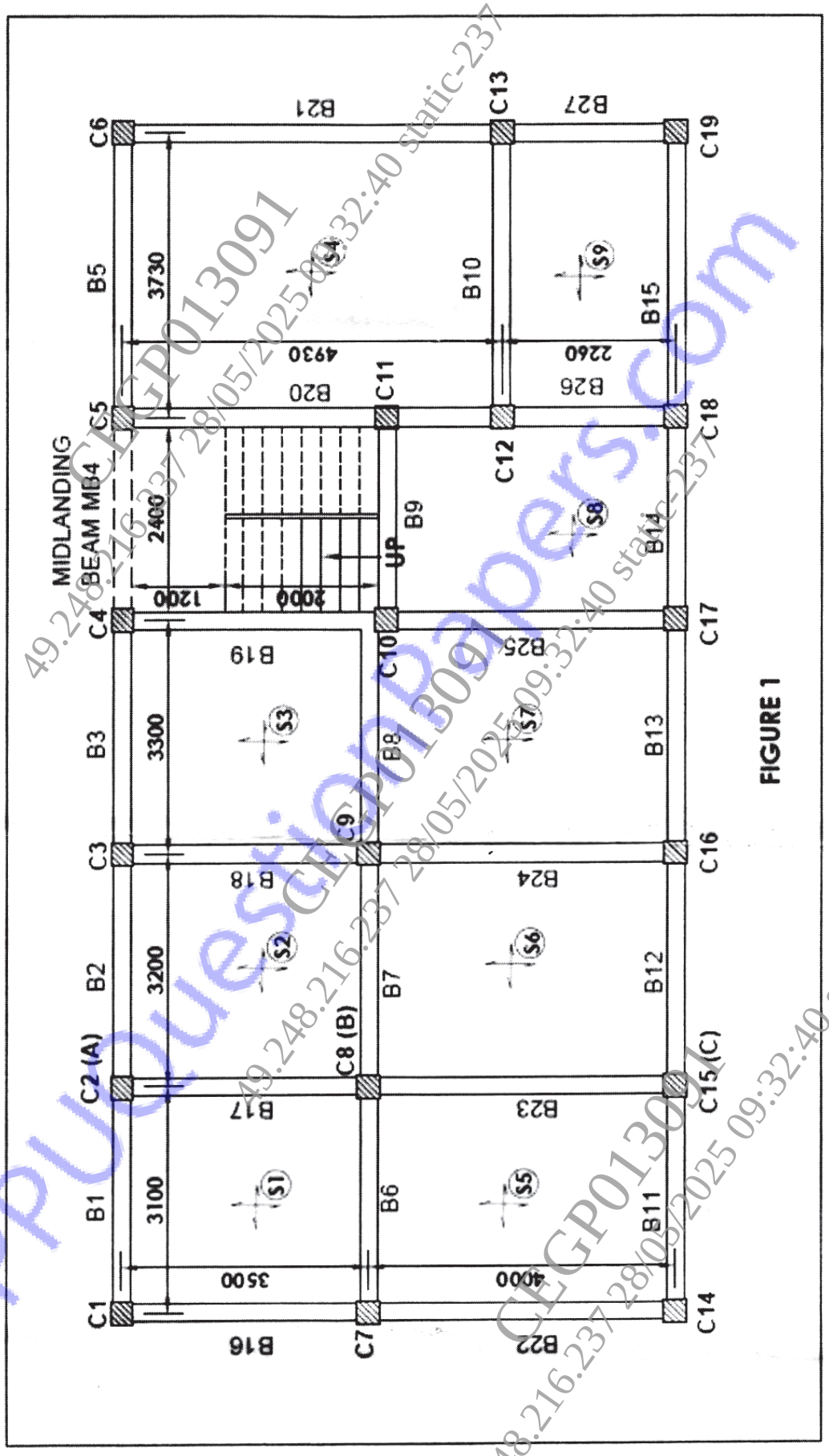

FIGURE 1

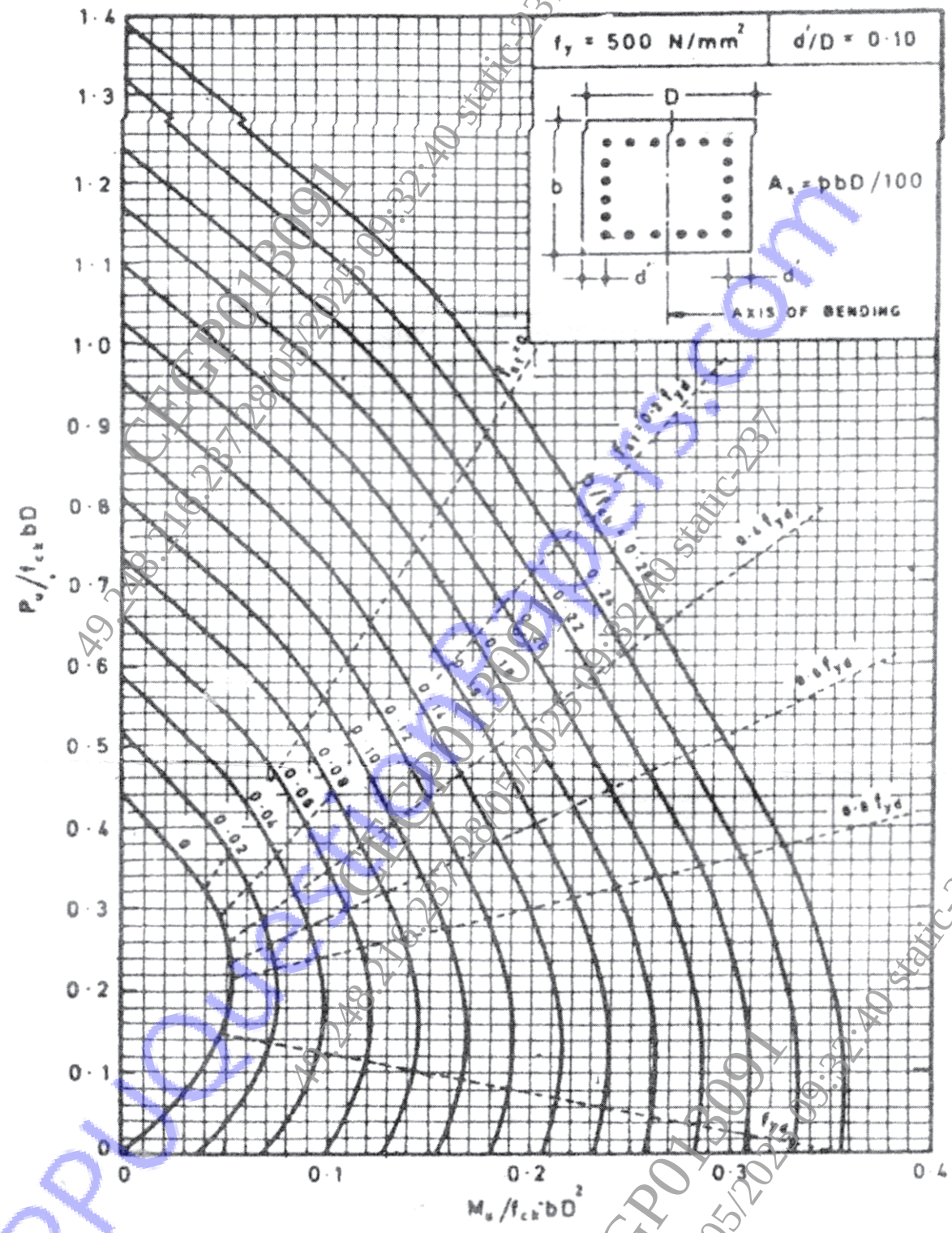

Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

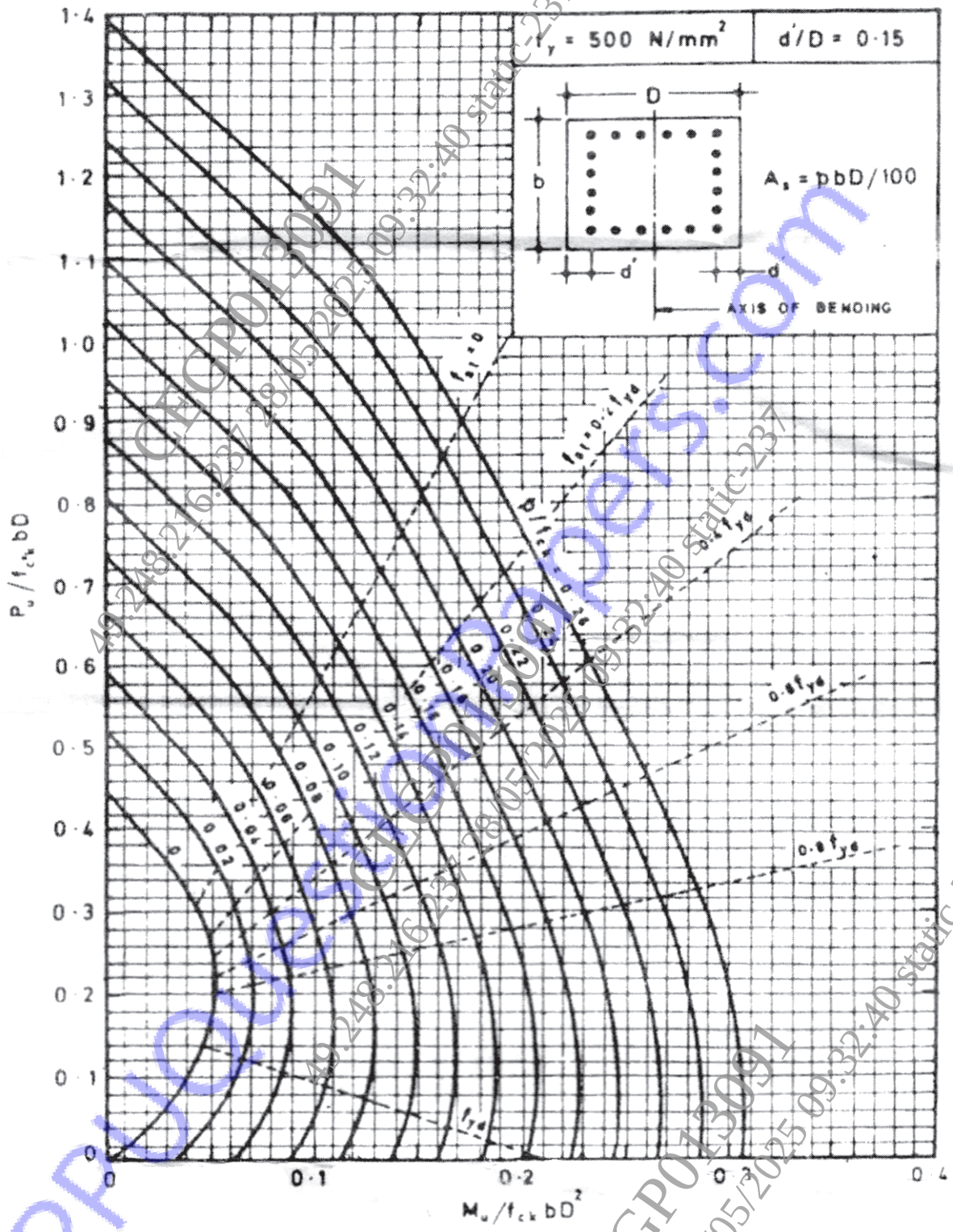

Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

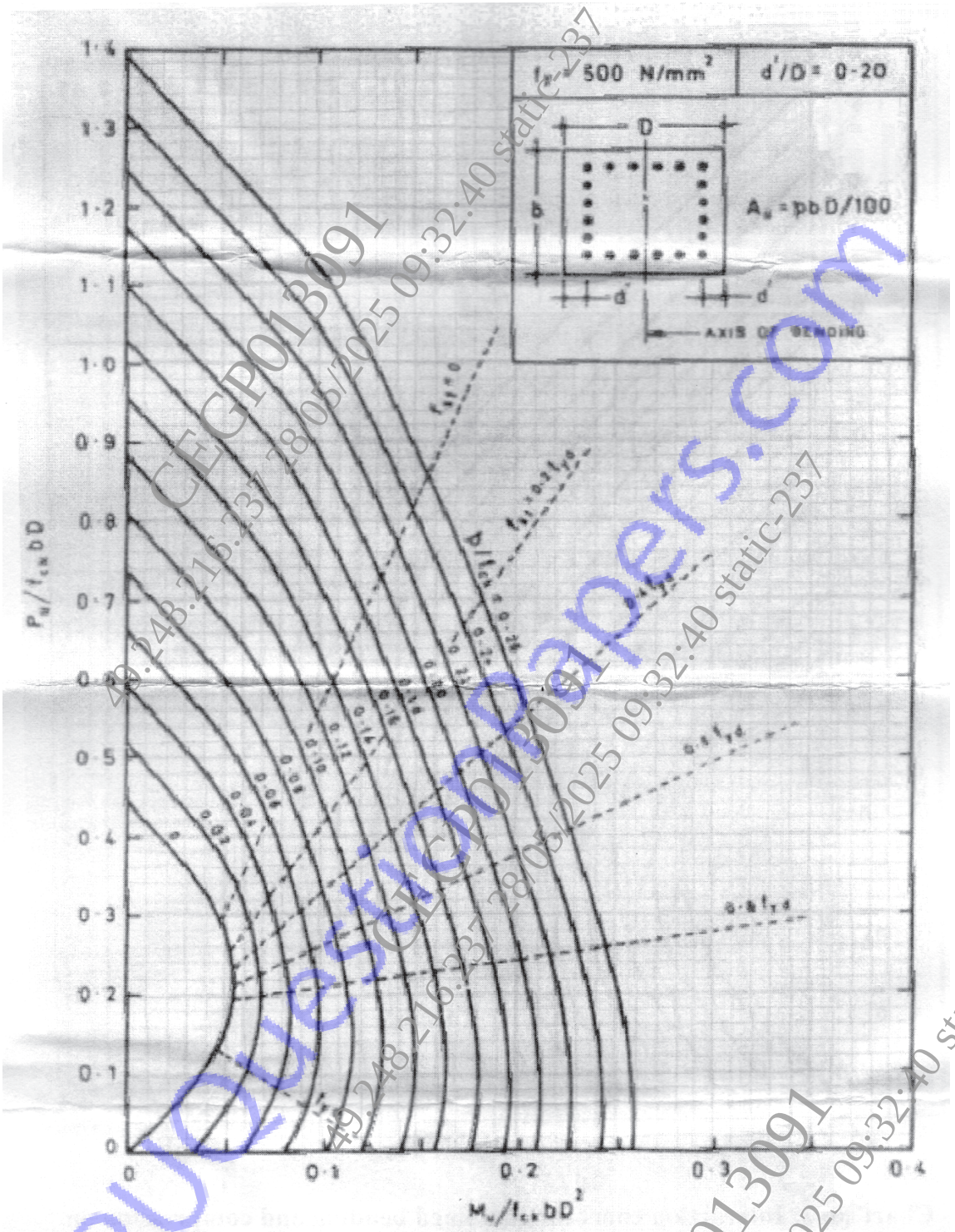

Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides