

Total No. of Questions : 8]

SEAT No. :

PC1696

[6353]-12

[Total No. of Pages : 5

**T.E. (Civil Engineering)**  
**DESIGN OF RC STRUCTURES**  
**(2019 Pattern) (Semester-II) (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) Explain curtailment of reinforcement in a beam. Explain the procedure of finding APC and TPC for a simply supported beam. [5]
- b) Design an intermediate flight of an open well staircase of residential building with the following data : [13]
- i) Length of going = 2.0m.
  - ii) Rise= 175mm; Tread=250mm; Width of flight= 1.2m.
  - iii) Landing width on both side of going = 1.2m.
  - iv) Width of supporting beams on outer side of landing = 230mm.
  - v) Material – M20, Fe 415; Mild exposure condition.
  - vi) Draw details of reinforcement. Use LSM approach.

OR

- Q2)** a) Explain in detail zoning of shear reinforcement. [5]
- b) Design a cantilever beam with following data : [13]
- i) Clear Span of beam = 3.0 m
  - ii) Depth of column supporting the beam = 450mm
  - iii) Beam width = 230 mm
  - iv) The beam is subjected to working dead load of 18 kN/m (including its self-weight) and working live load of 12 kN/m.
  - v) Material- M25, Fe 500; Moderate exposure condition
  - vi) Design longitudinal reinforcement and shear reinforcement.
  - vii) Show details of reinforcement. Use LSM

- Q3)** Design a continuous RC beam PQRS for flexure and shear using IS Code method. PQ=QR=RS=4.0m. The beam supports 125mm thick two way slab on either side of it. The beam is subjected to ultimate dead load of 24 kN/m (including its self-weight) and ultimate live load of 14 kN/m. Consider material M30, Fe 500 and severe exposure condition, Show the reinforcement detail in longitudinal section and cross-section at continuous supports and at mid spans. Use LSM. [17]

P.T.O.

OR

**Q4)** Continuous RC beam ABC of rectangular section is simply supported at A and C and continuous over support B. Span AB = 6.0m and BC = 4.5m. The beam carries working dead load of 20 kN/m (including its self-weight) and working live load of 13 kN/m. Calculate all span and support ultimate moments. Apply 20 % redistribution of moments. Design all spans and supports for flexure. Determine position of TPC and APC. Also design RHS portion of span AB for shear. Draw the reinforcement details. [17]  
Material - M30, Fe 500; Severe exposure condition.

- Q5)** a) What are interaction curves? Explain the characteristics of a typical interaction curve. [5]  
b) Design a uni-axial short column by limit state method to carry a working axial load of 1100 kN, Working axial moment of 100kN-m about major axis. The unsupported length of column is 3.6m. The column is fixed at both the ends. Show detailed design calculations and reinforcement details. Use M30 concrete and Fe 500 steel. Consider severe exposure condition. [13]

OR

**Q6)** Design a bi-axial short column by limit state method to carry a working axial load of 900 kN. Working moment of 60 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 3.6m about major axis and 4.5m about minor axis. The column is fixed at one end and hinged at the other. Show details of reinforcement in plan and sectional elevation. Use M25 concrete and Fe 500 steel. Consider moderate exposure condition. [18]

**Q7)** Design an isolated pad footing for a column of size 380 × 450mm subjected to working axial load of 1200 kN. SBC of soil is 275 kN/m<sup>2</sup>. (neglect check for one way shear about minor axis).  
Show detailed design calculations and reinforcement details in plan and sectional elevation. Use M25 concrete and Fe 500 steel. Consider moderate exposure condition. [17]

OR

**Q8)** Design a slab type rectangular combined footing for two columns A and B subjected to ultimate axial load 1500 kN and 1300 kN, respectively. Center to center to distance between two columns is 2.8m. Size of both the columns is 450 × 450mm. Safe bearing capacity of soil is 180kN/m<sup>2</sup>. Use M35 concrete and Fe500 steel. (Neglect check for one way shear). [17]

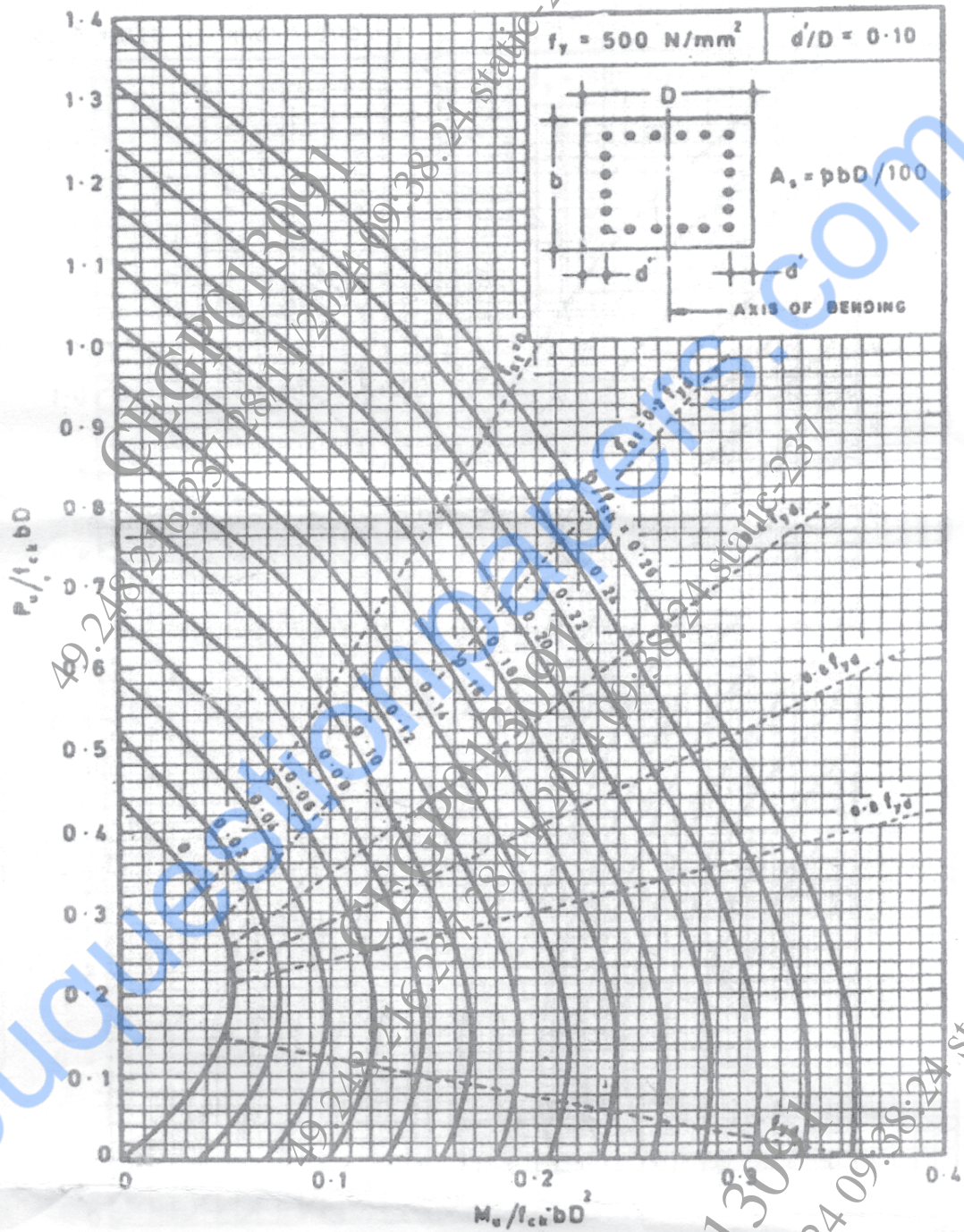


Chart No 1 : Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides.

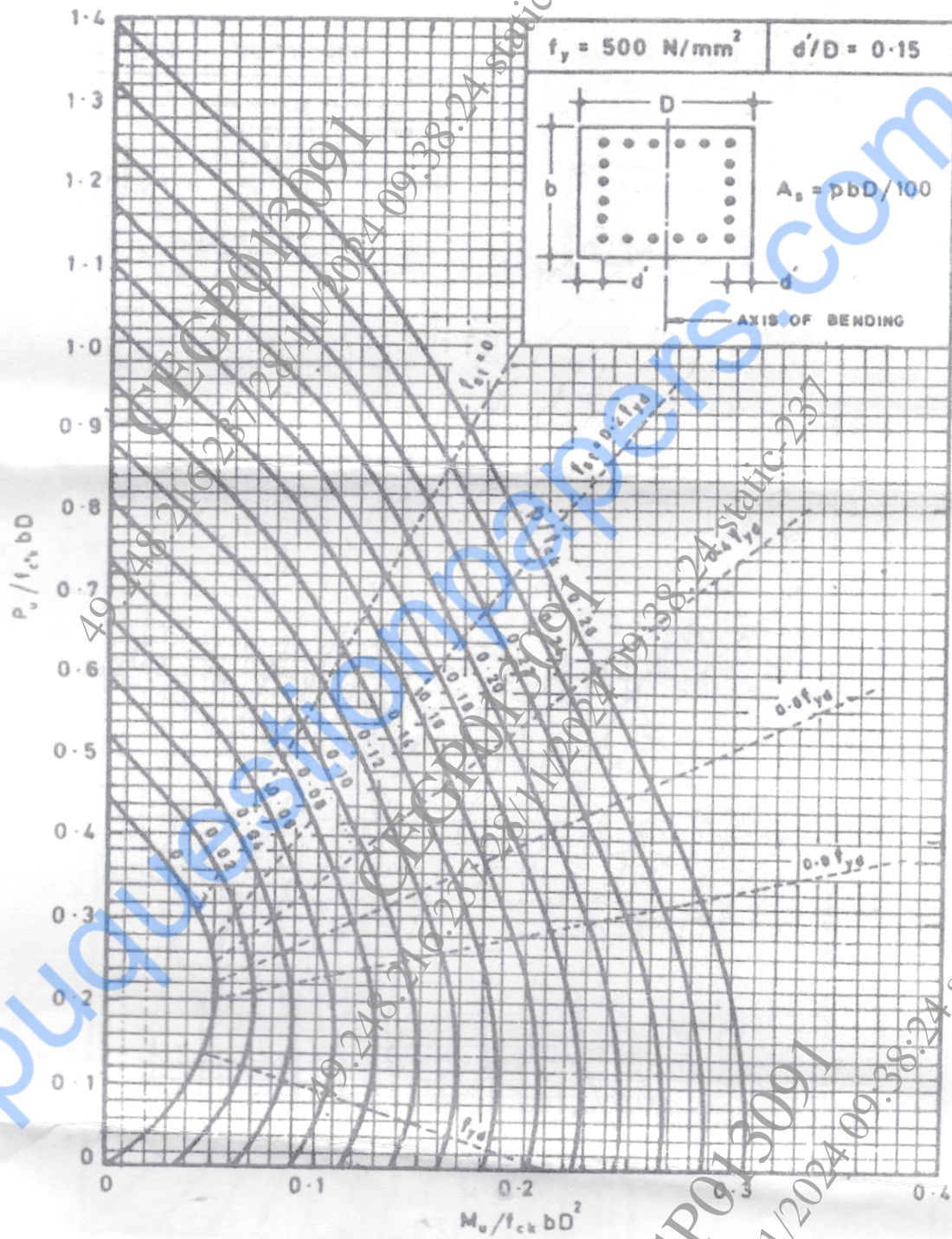


Chart No 2 : Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides.

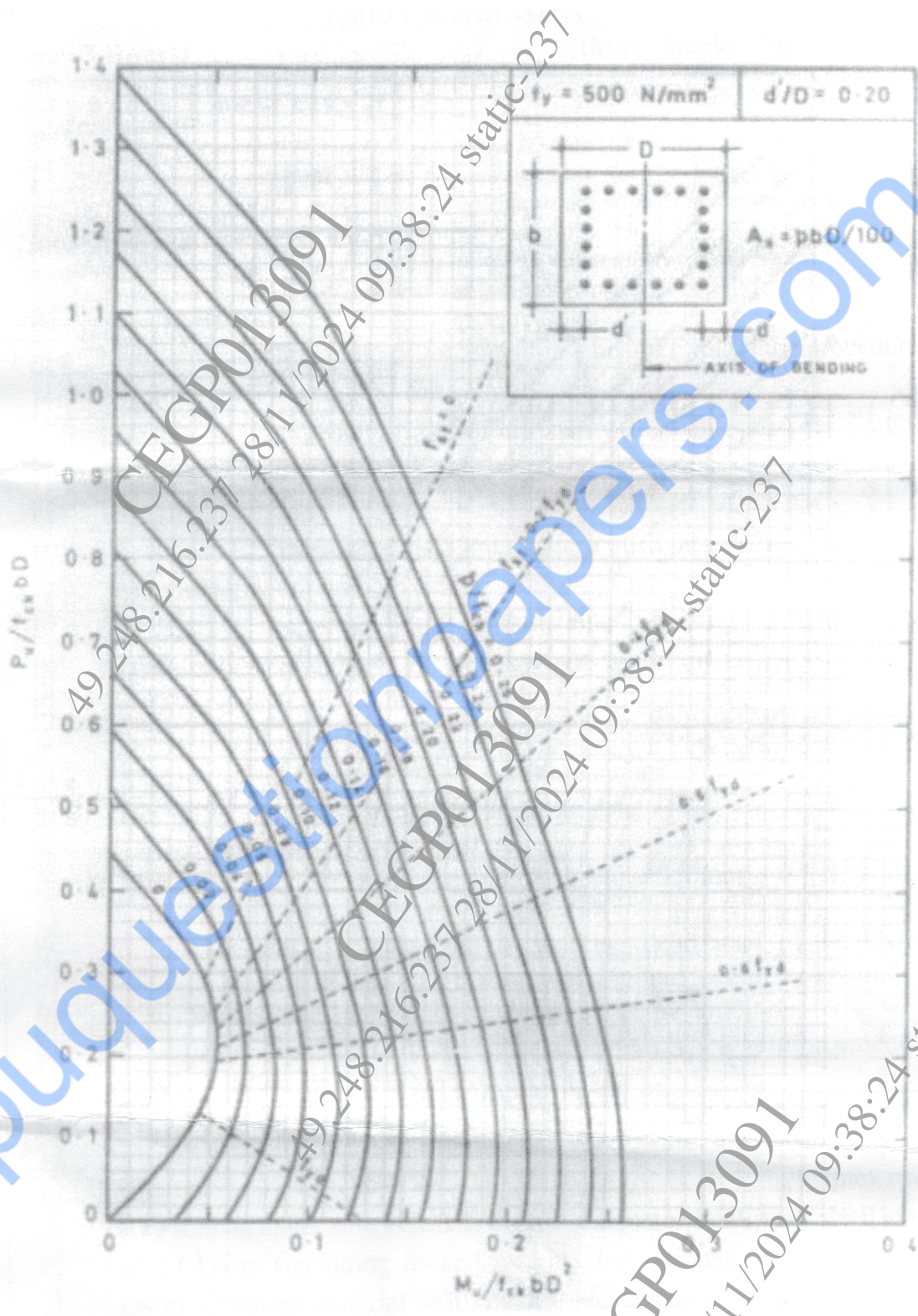


Chart No 3 : Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides.

