Total No. of Questions : 8]

SEAT No. : ____

P997

[Total No. of Pages : 6

[5870]-1012

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.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6, Q.No.7 or Q.No.8.***
2) ***Bold 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) What is Redistribution of moments and what are advantages of it? **[5]**

b) Design the second flight (midlanding level to first floor level) of a dog legged staircase of public building with the following data: **[13]**

i) Floor to floor height = 3.3m

ii) Rise = 150mm; Tread = 300mm; Width of flight = 1.5m

iii) Width of mid level landing = 1.5m

iv) width of floor level landing = 1.8m

v) Width of supporting beams = 300mm

vi) Supporting beams are provided at the outer edges of both landings

vii) Material = M30, Fe 500

viii) Draw details of reinforcement. USe LSM approach.

OR

P.T.O.

Q2) a) Explain the terms bond stress and development length. Calculate development length for 20mm diameter bar in tension by LSM approach. **[5]**

i) for M25 concrete and Fe 500 steel.

ii) for M20 concrete and Fe 250 steel.

b) Cantilever reinforced concrete floor beam with following data : **[13]**

i) Center Span of beam = 2.5 m

ii) Width of supporting columns = 450mm

iii) Beam width = 230 mm

iv) The beam is subjected to working dead load of 20 kN/m (including its self-weight) and working live load of 18 kN/m.

v) Material - M25, Fe 500

vi) Design longitudinal reinforcement (with curtailment) and shear reinforcement.

vii) Show details of reinforcement. Use LSM

Q3) Design a continuous beam ABCD for flexure and shear using IS Code method. AB=BC=CD=4.5m. The beam carries dead load of 20 kN/m (including its self-weight) and live load of 12 kN/m. Take material M25 and Fe 500. Show the reinforcement detail in longitudinal section and cross-section at continuous supports and at mid spans. 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 = 5.0m, BC = 4.0m and CD = 6.0m. The beam carries working dead load of 20 kN/m (including its self-weight) and working live load of 12 kN/m. The beam supports 120mm slab on one side. Calculate design moment for all **spans and supports** after 20% redistribution of moments. Design all spans and supports sections for **flexure only**. Draw the reinforcement details. **[17]**

Material - Concrete of grade M30, Fe 500 reinforcement.

Q5) a) Explain different parameters of interaction curves for the design of column. **[5]**

b) Design a uni-axial short column by limit state method with material M25 and Fe 500 to carry a working load of 800 kN, working moment of 60 kN-m about major axis bisecting the depth of column. The unsupported length of column is 4.0m.The column is fixed at both the ends. Show detailed design calculations and reinforcement details. **[13]**

OR

Q6) Design a bi-axial short column by limit state method with material M20 and Fe 500 to carry Ultimate load of 1600 kN. Factored moment of 110 kN-m about major axis bisecting the depth of column and 60 kN-m about minor axis bisecting the width of column. The unsupported length of column is 3.6m. The column is fixed at both the ends. Show details of reinforcement in plan and sectional elevation. **[18]**

Q7) Design an isolated pad footing for a working axial load of 800 kN. Use M25 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 750 kN and 800 kN, respectively. Center to center to distance between two columns is 2.5m. Size of both the columns is 380 × 380mm. Safe bearing capacity of soil is 150kN/m^2. Use M25 concrete and Fe 500 steel. neglect check for one way shear. **[17]**

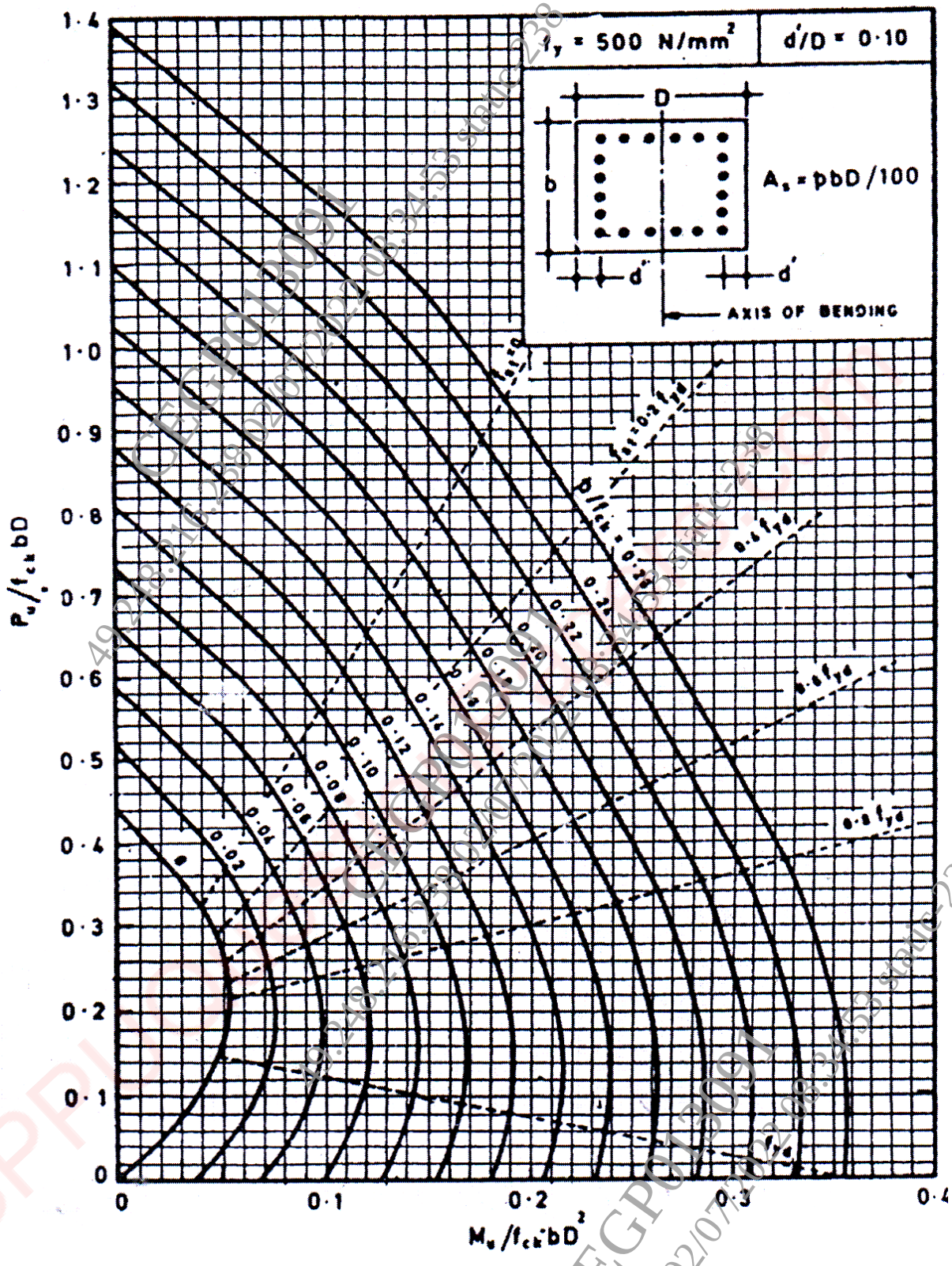

Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

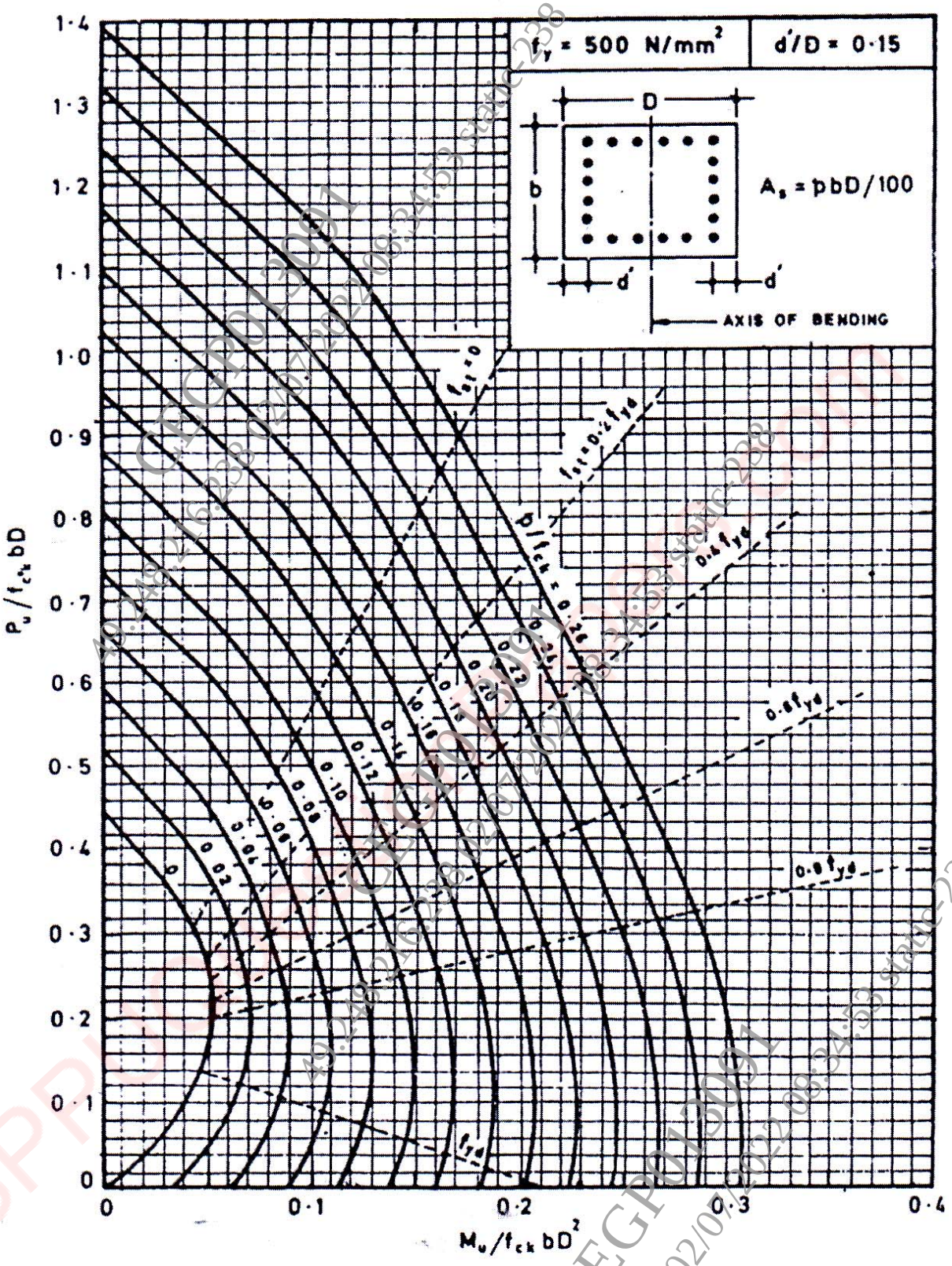

Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides

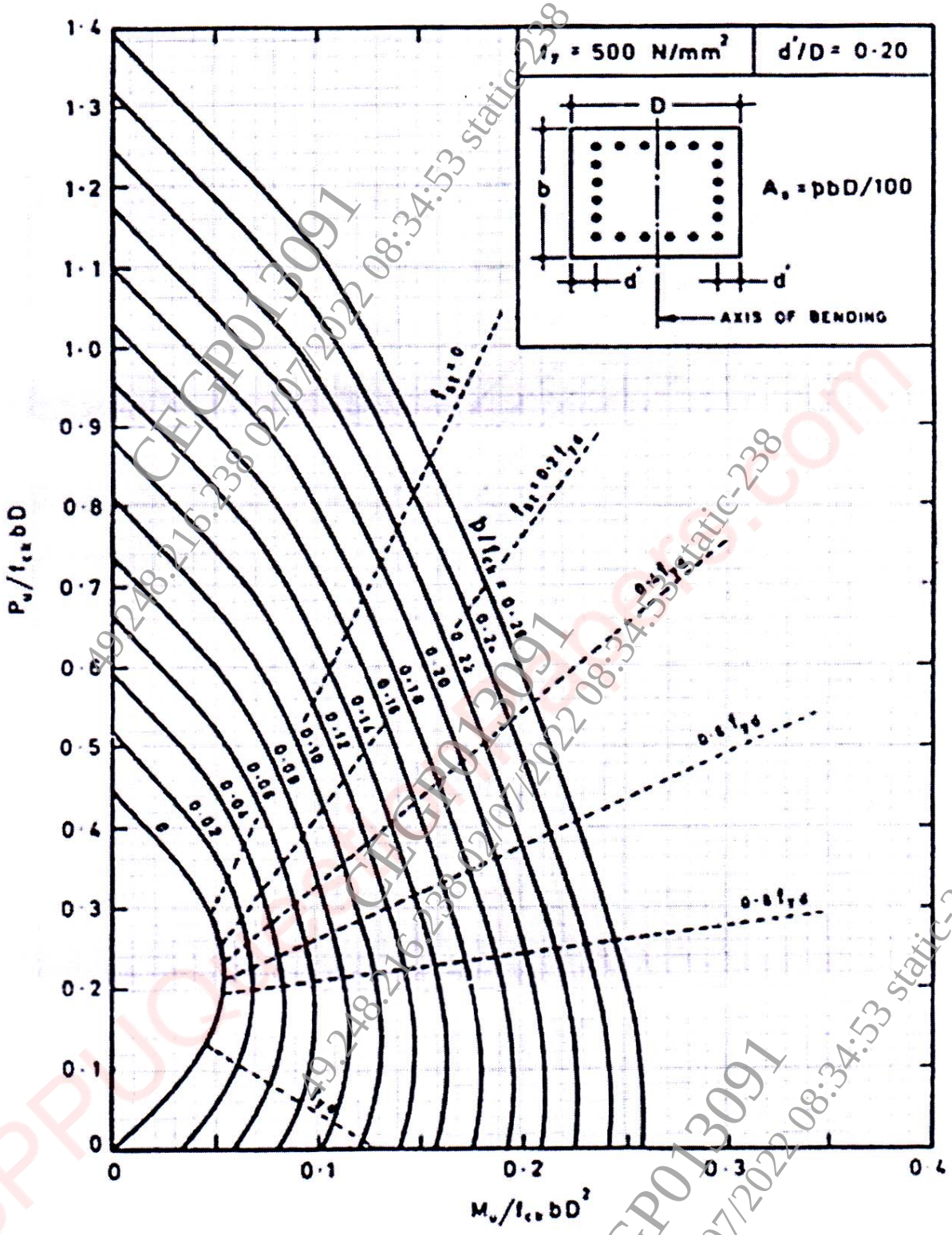

Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides