

Total No. of Questions : 12]

SEAT No. :

P3472

[5560]-109

[Total No. of Pages : 6

T.E. (Civil)

STRUCTURAL DESIGN - II

(2012 Course) (Semester - II) (End Sem.) (301010)

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, Q.9 or Q.10 and Q.11 or Q.12.*
- 2) *Bold figures to the right indicate full marks.*
- 3) *Use of IS 456-2000 and non programmable calculator is allowed.*
- 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) Compare working stress method (WSM) with limit state method (LSM)

[4]

b) Why partial safety factor for concrete is higher than that for steel. **[2]**

OR

Q2) A RC beam 300 mm X 600 mm overall is reinforced with 4 number of 16 mm diameter bar. Using WSM approach, calculate stresses induced in concrete and steel when bending moment of 60 kNm is applied. Use M20 grade of concrete, Fe 250 steel and 40 mm cover to tension reinforcement. **[6]**

Q3) A rectangular beam section, 230mm wide and 600mm deep is reinforced with 4 bars of 20mm diameter in the tensile zone and 2 bars of 16mm in the compression zone. The clear cover is 25mm for both the reinforcement. Determine ultimate moment of resistance of the section using. Use M25 grade of concrete and Fe 415 grade of steel. **[8]**

OR

Q4) Calculate the area of tension reinforcement, A_{st} for T-beam to resist factored bending moment $M_u = 210$ kNm. Following are sectional properties of T-beam **[8]**

Width of flange, $b_f = 1000$ mm

Depth of slab, $D_f = 100$ mm

Width of web, $b_w = 300$ mm

Effective depth, $d = 450$ mm

Grade of concrete = M 20

Grade of steel = Fe 415

P.T.O.

Q5) Design a cantilever RC slab for an effective span of 1.2 m carrying live load of 3.25 kN/m^2 and floor finish of 1.25 kN/m^2 . Use M20 grade of concrete and Fe 250 grade of steel. Also show details of reinforcement. Use LSM approach. [6]

OR

Q6) Design a simply supported two-way slab panel having effective dimensions as $4.0 \text{ m} \times 3.5 \text{ m}$. Assume the corners are restrained against torsion and lifting up. Take live load of 3.50 kN/m^2 and floor finish of 1.50 kN/m^2 . Use M20 grade of concrete and Fe 415 grade of steel. Also show details of reinforcement. Use LSM approach. [6]

Q7) a) Design reinforcement required for a rectangular RC beam section for following data: [10]

Size of beam ($b \times D$) = $300 \text{ mm} \times 450 \text{ mm}$

Factored shear V_u = 35 kN

Factored bending moment M_u = 75 kNm

Factored torsional moment T_u = 40 kNm

Grade of concrete = M 20

Grade of steel = Fe 250

Also detail the reinforcement

b) Explain following with reasons: [6]

- i) Minimum shear reinforcement is required to be provided in beams
- ii) The useful contribution to shear resistance by bent up bars is restricted to only 50% of total shear reinforcement.

OR

Q8) Design a continuous beam ABCD ($AB = BC = CD = 3.75 \text{ m}$) for flexure and shear using IS code method for following data: [16]

Dead load = 14 kN/m

Live load = 25 kN/m

Grade of concrete = M 20

Grade of steel = Fe 250

Also detail the reinforcement

Q9) a) What are advantages of redistribution of moments? [4]

- b) A continuous RC floor beam is simply supported at A and C and continuous over support B. Span AB = Span BC = 3.75 m. The beam carries a working dead load of 18 kN/m and a working live load of 28 kN/m. Calculate the design moment at continuous support and near mid-span of AB and BC assuming 15 % redistribution of moments from an elastic analysis at ultimate load. Draw the design moment envelope and design the beam for flexure and shear.

Use M20 grade of concrete and Fe 415 grade of steel. [12]

OR

Q10)a) Design a short helically reinforced column of effective length 3.5 m to carry working axial load of 1100 kN. Use M 20 grade of concrete and Fe 250 steel. [4]

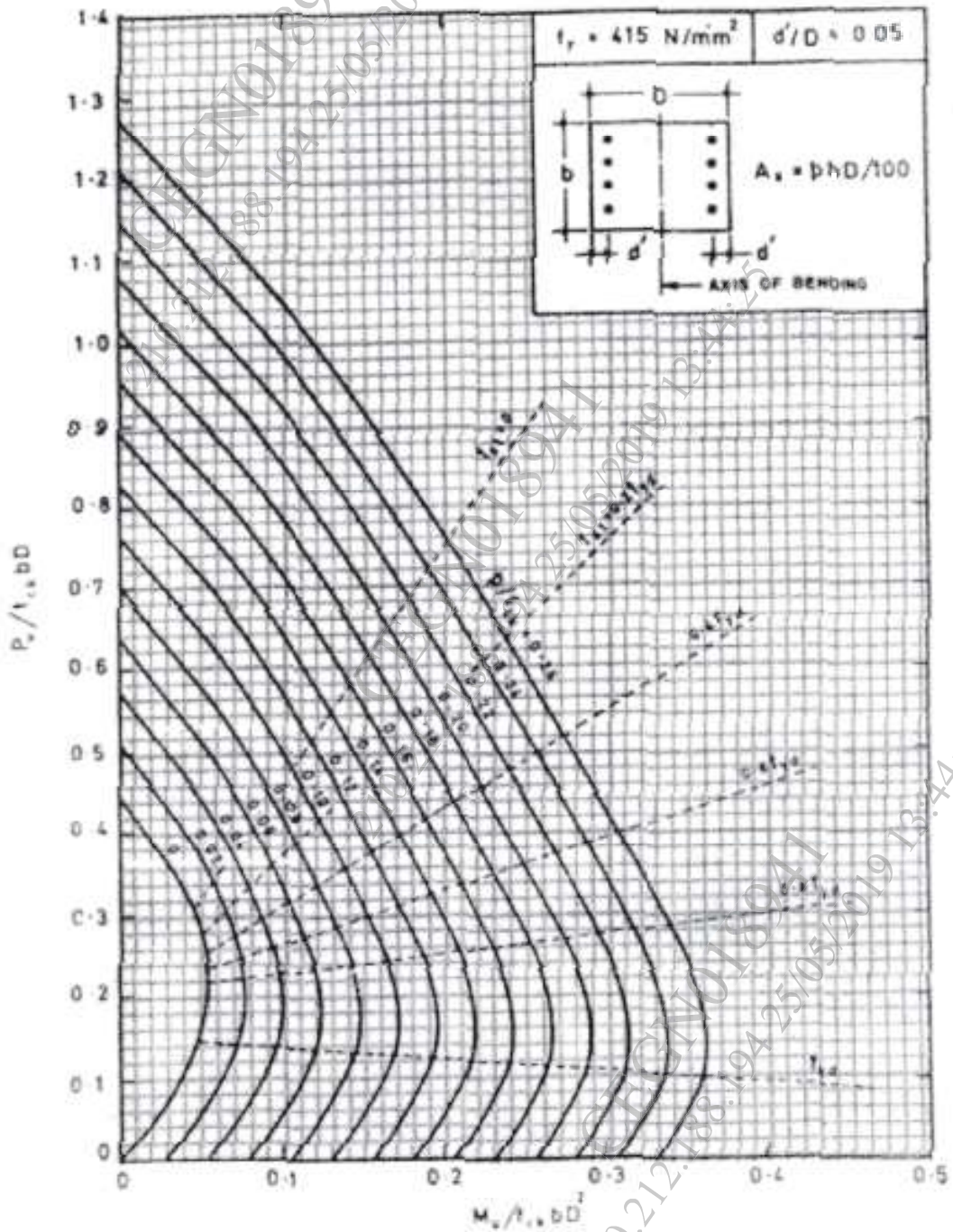
- b) Design a rectangular column subjected to working axial load of 800 kN along with a working moment of 70 kN/m about an axis bisecting the depth. The unsupported length of column is 5.6 m. Assume column is effectively held in position and restrained against rotation at both the ends. Grade of concrete is M 20 and steel as Fe 415. Use charts for column design. Provide equal steel on both tension and compression face. [12]

Q11) Design an isolated rectangular footing for the RC column of size 300 mm X 750 mm, reinforced with 6 bars of 20 mm diameter and carrying working axial load of 1300 kN (working). The safe bearing capacity of soil is 200kN/m². Use M20 grade of concrete and Fe 415 steel. Show detailed design calculations and draw reinforcement details in plan and sectional elevation. [18]

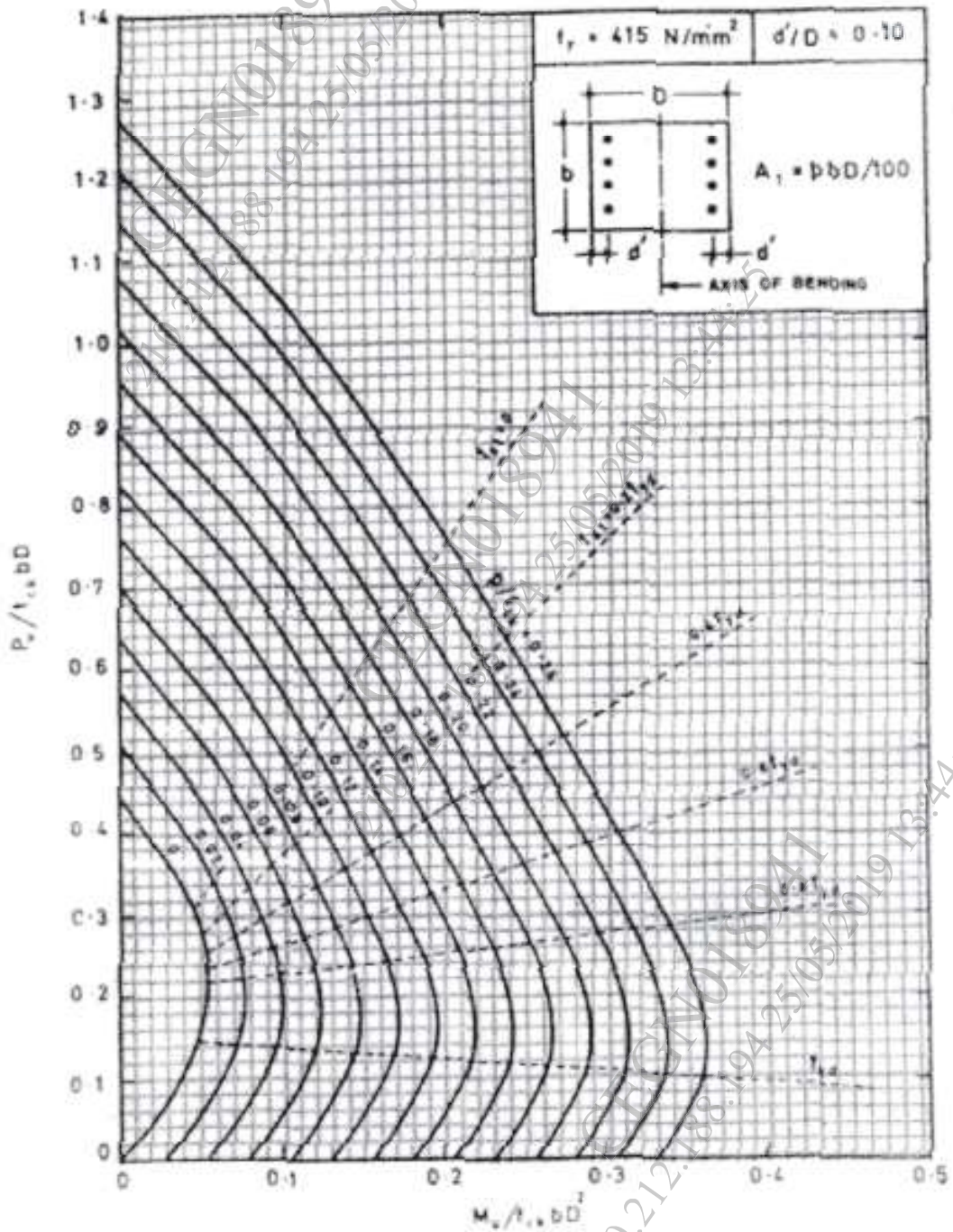
OR

Q12) Design a suitable footing for a 400 mm X 400 mm column with 6 bars of 25 mm diameter transferring 1200 kN working axial load and a working moment of 40 kNm. The safe bearing capacity of soil is 200kN/m². Use M20 grade of concrete and Fe 415 steel. Show detailed design calculations and draw reinforcement details in plan and sectional elevation. [18]

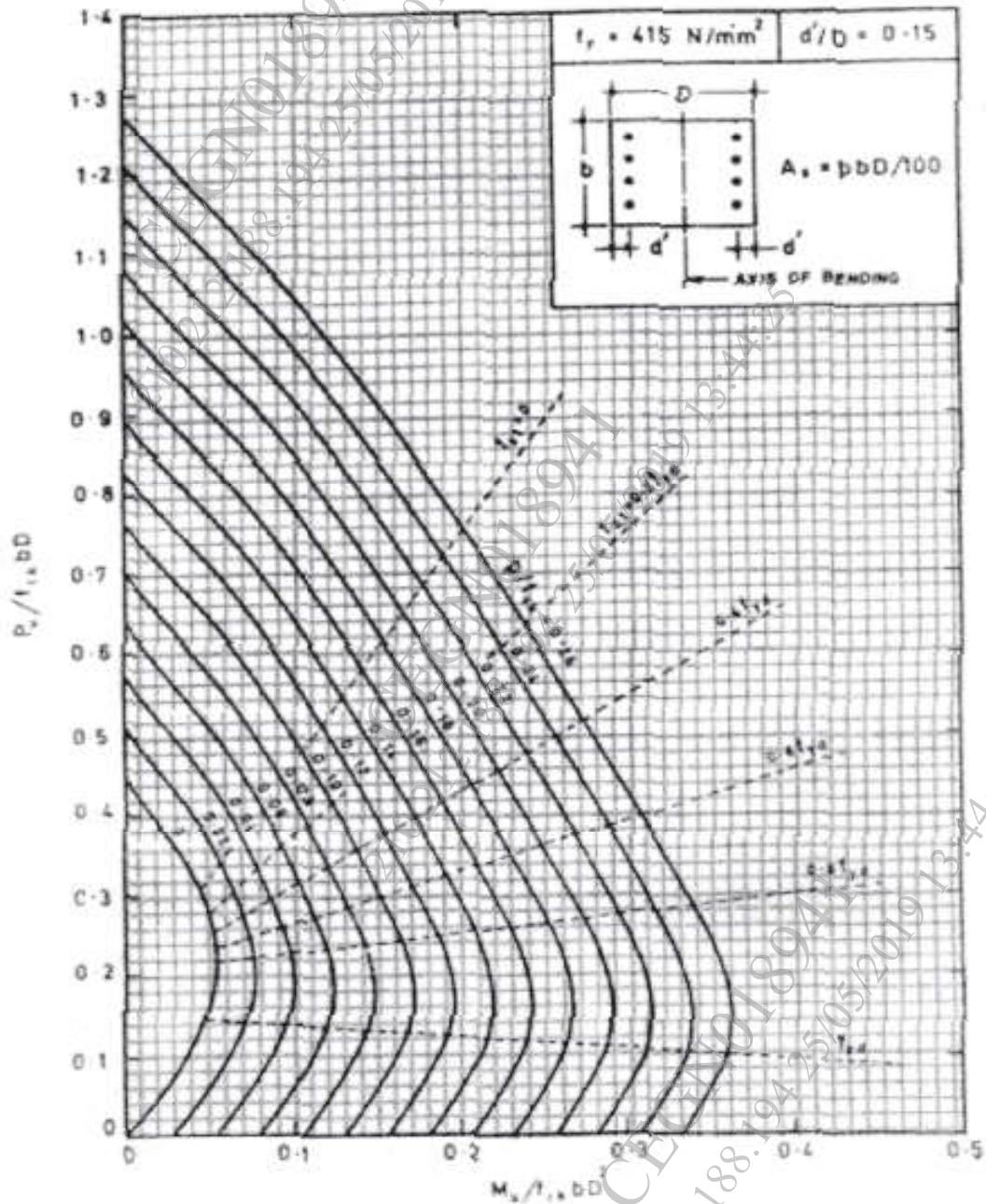
SP 16 Chart 31 COMPRESSION WITH BENDING – Rectangular
Section – Reinforcement Distributed Equally on Two Sides



SP 16 Chart 32 COMPRESSION WITH BENDING – Rectangular
Section – Reinforcement Distributed Equally on Two Sides



SP 16 Chart 32 COMPRESSION WITH BENDING – Rectangular
Section – Reinforcement Distributed Equally on Two Sides



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