Total No. of Questions : 12]

SEAT No. :

P2920

[Total No. of Pages : 7

[5669]-509

T.E. (Civil) (Semester - II)

STRUCTURAL DESIGN - II

(2015 Pattern)

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 and Q.9 or Q.10 and Q.11 or Q.12.***
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) Determine the required effective depth and corresponding area of tension reinforcement for 300 mm wide rectangular RC beam to resist working bending moment of 75 kN-m. Use M20 grade of concrete and Fe 415 steel. Adopt WSM approach. **[5]**

OR

Q2) Design a rectangular RC beam section to resist working moment of 60 kN-m. The width and overall depth of beams are restricted to 300 mm and 450 mm, respectively due to architectural requirements. Use M20 grade of concrete and Fe 415 steel. Adopt WSM approach. **[5]**

Q3) Explain the terms bond stress and development length. Calculate development length for 16mm diameter bar in compression and tension by both methods (WSM and LSM). Use M30 concrete and Fe 500 steel. **[7]**

OR

Q4) Find the area of tension reinforcement for a flanged section to resist ultimate moment 675 kN-m. Sectional properties of flanged sections are: b_f = 1200 mm; D_f = 120 mm; b_w = 300 mm; d = 600 mm. Material properties of flanged sections are: M20 grade of concrete and Fe 415 steel. **[7]**

P.T.O.

Q5) Figure 1 shows the center line layout of a typical floor for an office building. The live load and floor finish are 3.5 kN/m^2 and 1.25 kN/m^2, respectively. Design simply supported slab panel S_8 using LSM approach. The grade of concrete is M20 and steel is Fe 500. Show details of reinforcement. **[8]**

OR

Q6) Figure 1 shows the layout of a typical floor for an office building. The live load and floor finish are 3.5 kN/m^2 and 1.25 kN/m^2, respectively. Design slab panel S_1 using LSM approach (Only for Flexure). The grade of concrete is M20 and steel is Fe 500. Show details of reinforcement. **[8]**

Q7) a) A rectangular RC beam 300 mm × 420 mm effective is reinforced with 3 number 20 mm diameter bars on tension side. The beam is subjected to a factored load of 60kN/m on entire span of 6.5m. Design the shear reinforcement using vertical stirrups. Use M20 grade of concrete and Fe 415 steel. **[7]**

b) A R.C. beam rectangular in cross section 230 mm wide and 400 mm overall deep is reinforced with an effective cover of 35 mm from the nearer face. Calculate the strength of the section in torsion when it is also subjected to factored shear of 10 kN and factored bending moment of 42 kN-m. Also design the transverse reinforcement for the section. Use M20 grade of concrete and Fe 415 steel. **[10]**

OR

Q8) Using IS code coefficients design a continuous beam B_{18}-B_{19}-B_{20} of a typical floor for an office building shown in figure 1. All slab panels are 130 mm thick. The live load and floor finish for slabs are 3.5 kN/m^2 and 1.25 kN/m^2, respectively. This continuous beam also supports 230 mm thick brick masonry wall of 3.00 m height. Use LSM approach. Show details of tension as well as shear reinforcement. Use M25 grade of concrete and Fe 500 steel. **[15]**

Q9) A R.C. beam ABC is simply supported at A and C and continuous over support B. Span AB = 5m and Span BC = 4 m. The beam carries dead load (inclusive of self weight) of 25 kN/m and live load of 20 kN/m. Calculate design moments at central support B and near mid-span of AB after 15% redistribution of moments. Draw the design moment envelopes and design the beam for flexural only. Use M25 grade of concrete and Fe 500 steel. **[15]**

OR

Q10) In a multi-storyed building a corner column is subjected to ultimate axial load of 2100 kN and ultimate moment of intensity 85 kN-m about major axis bisecting the depth of column. The ultimate moment about minor axis bisecting the width of column is 35 kN-m. The effective lengths of column about major and minor axis are 5 m and 3 m, respectively. The unsupported length about both axes is 4.5 m. Design this bi-axial rectangular short column by LSM approach with material M30 and Fe 415 steel. The environmental exposure condition is severe. Show details of reinforcement in plan and sectional elevation. **[15]**

Q11) Design a short axially loaded column and its isolated footing for carrying a working axial load of 750 kN. The effective length of column is 3.0 m. Use M20 grade of concrete and Fe 415 grade of steel. SBC of soil is 200 kN/m^2. **[18]**

OR

Q12) Design a short RC column by using M20 concrete and Fe 500 steel to carry a working axial load of 850 kN and working moment of 85 kN-m about major axis bisecting the depth of column. The unsupported length of column is 3.00 m and both ends of column are pinned. Also design isolated pad footing for the column only for two way shear and flexure. Take SBC of soil as 200 kN/m^2. Show details of reinforcement in plan and sectional elevation. Use given interaction charts. Use LSM approach. **[18]**

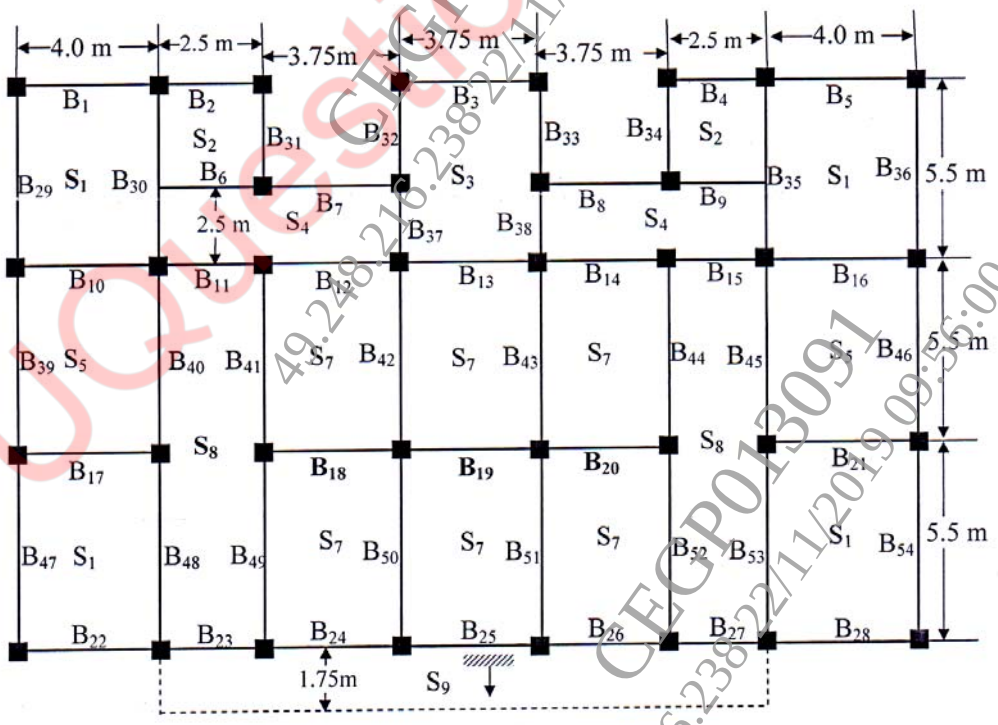

Figure 1: Structural layout of a typical floor for an office building

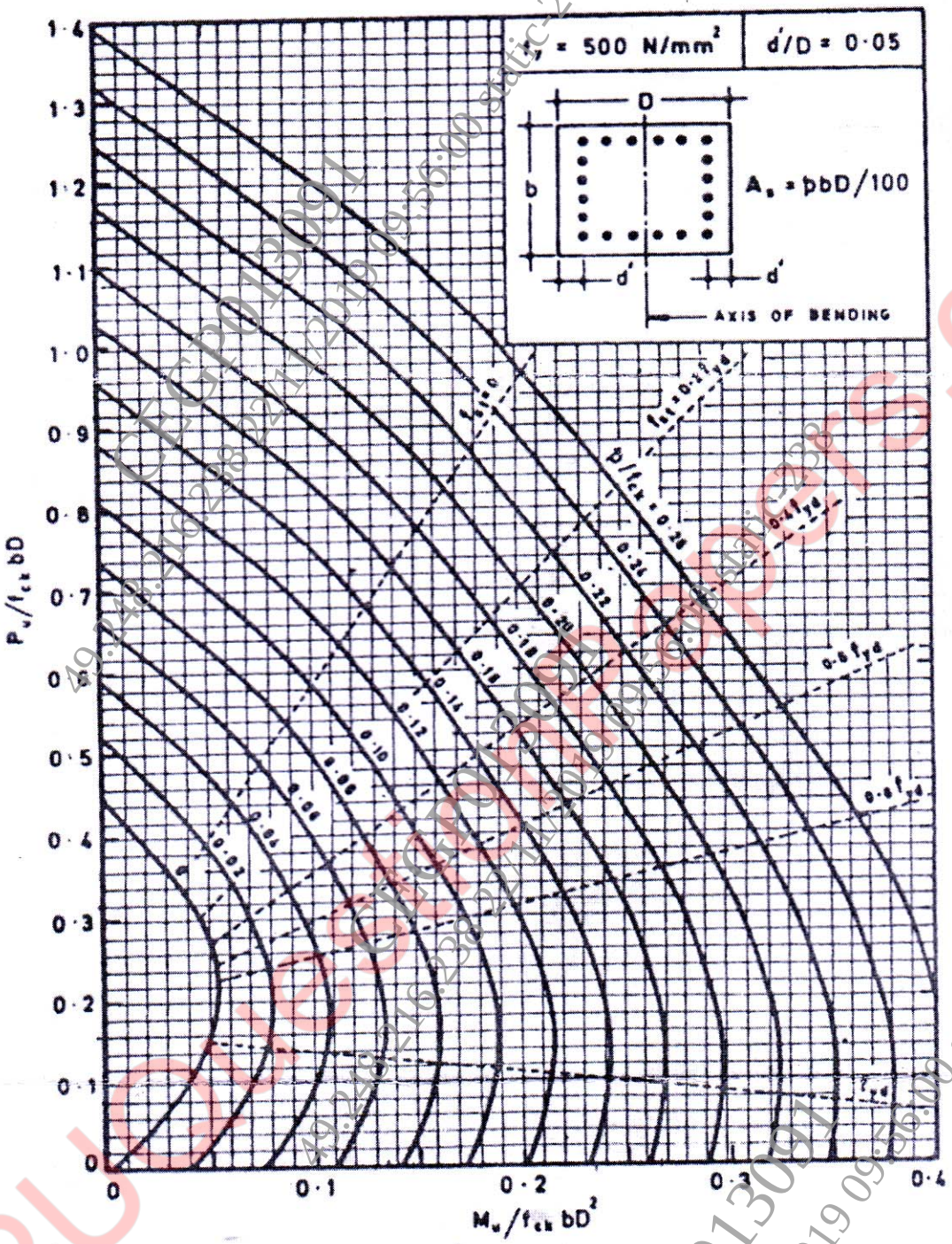

Chart No 1: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides.

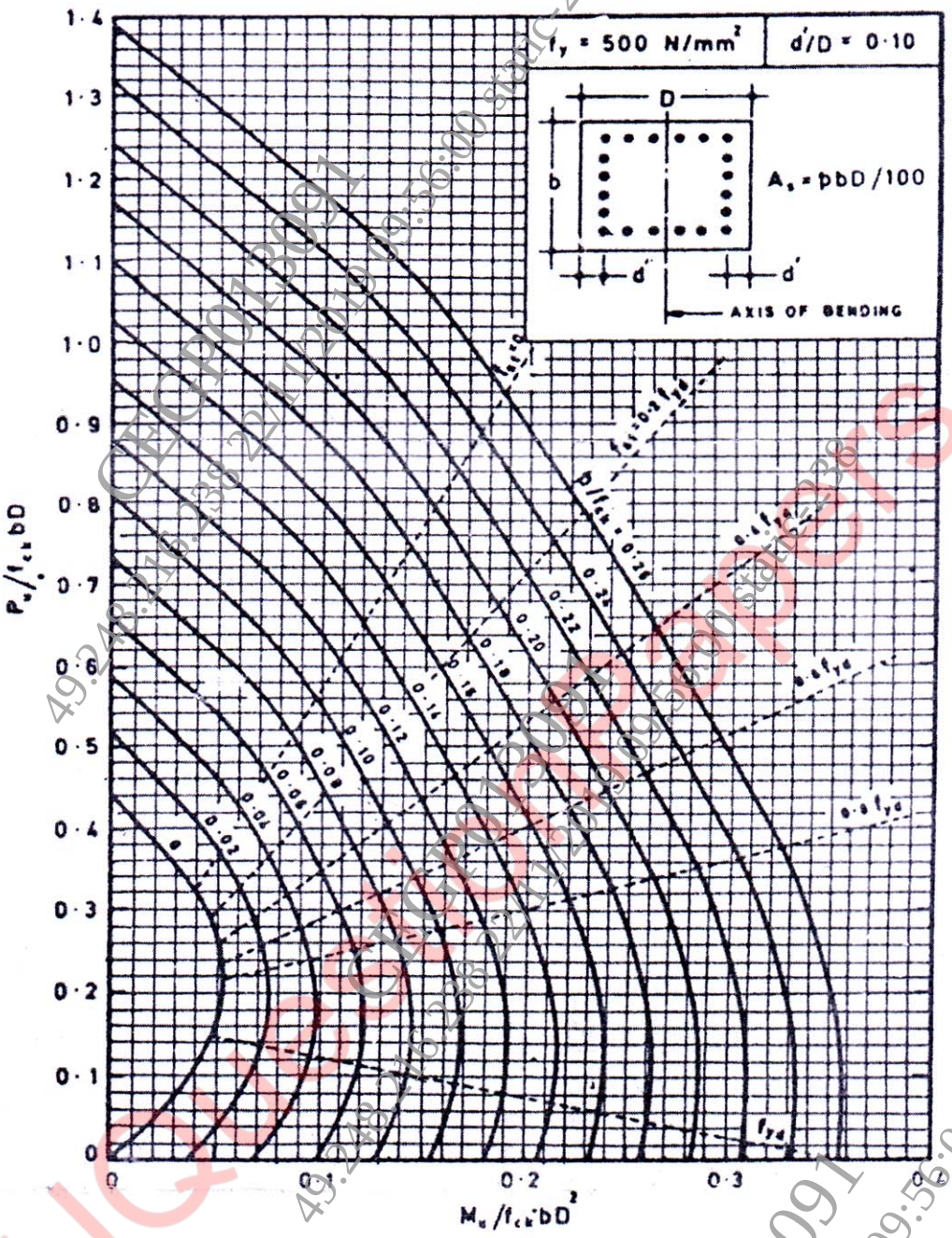

Chart No 2: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides.

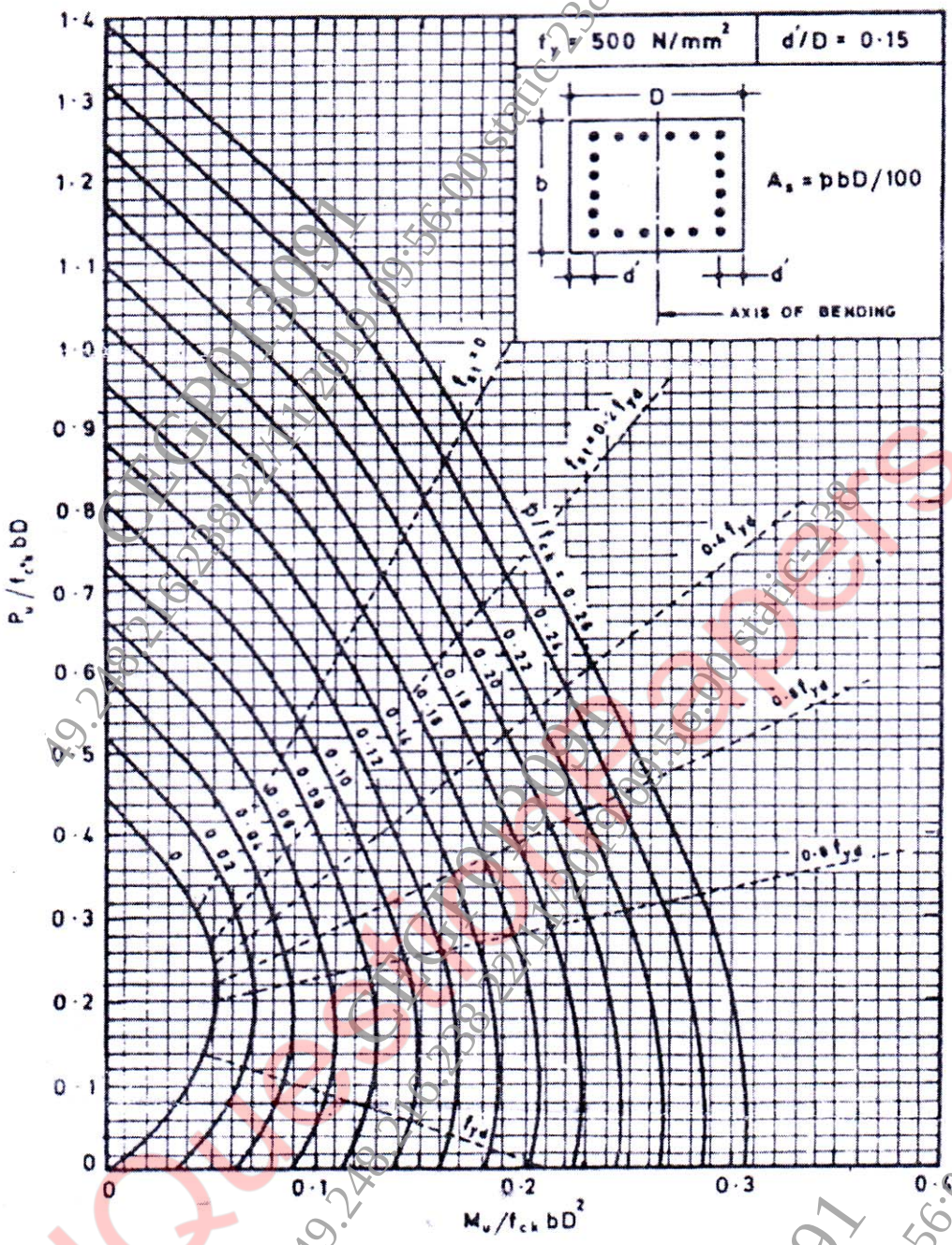

Chart No 3: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides.

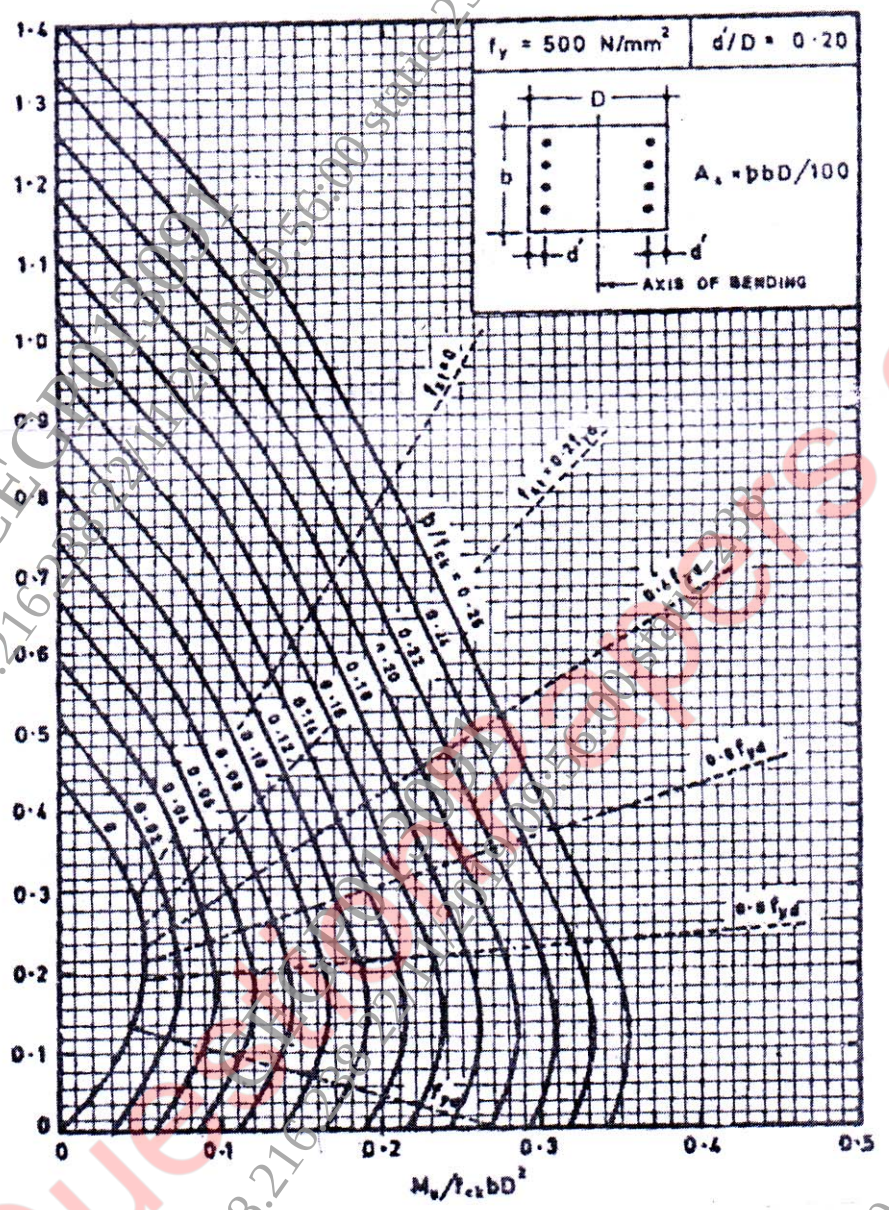

Chart No 4: Interaction chart for combined bending and compression on rectangular section with equal reinforcement on all sides.

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