Total No. of Questions : 8]

SEAT No. :

P747

[Total No. of Pages : 8

[4263] - 208

T.E. (Civil)

STRUCTURAL DESIGN - II

(2008 Pattern) (Semester - II)

Time :4 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, and Q.3 or Q.4 in section-I.***
2) ***Answer Q.5 or Q.6, and Q.7 or Q.8 in section-II.***
3) ***Answers to the two sections should be written in separate books.***
4) ***Figures to the right indicate full marks.***
5) ***Neat diagrams must be drawn wherever necessary.***
6) ***Use of IS : 456 - 2000 and non programmable calculator is allowed.***
7) ***Mere reproduction from IS code as answer will not be given full credit.***
8) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Answer the following **[9]**

i) Explain the stress strain relationship for concrete according to the assumptions in limit state of collapse in flexure.

ii) Explain the term 'Moment of Resistance' and its significance in the design of flexural members.

iii) Compare LSM with WSM from consideration of material behaviour.

b) A rectangular, singly reinforced beam, 300mm wide and 565mm effective depth is used as a simply supported beam over an effective span of 6m. The reinforcement consists of 4 bars of 20mm diameter at tension face. If the beam carries a load of 15kN/m, inclusive of its self weight, determine the stresses developed in concrete and steel using WSM. Use M20 concrete and Fe415 steel. **[8]**

c) Calculate the moment of resistance by LSM for flanged beam section detailed as below **[8]**

i) Width of rib = 230mm

ii) Effective flange width = 1250mm

iii) Thickness of flange = 120mm

P.T.O.

iv) Total depth = 600mm with clear cover 25mm

v) Tension steel = 6 No. of 20mm diameter bars.

vi) Use M25 grade of concrete and Fe415 grade of steel.

OR

Q2) a) A rectangular beam section, 300mm wide and 600mm deep is reinforced with 4 bars of 25mm diameter in the tensile zone and 2 bars of 16mm in the compression zone. The clear cover is 25mm for both the reinforcement. Determine moment of resistance of the section using WSM. Use M20 grade of concrete and Fe415 grade of steel. **[8]**

b) A reinforced concrete rectangular beam has width 300mm and total depth 750mm with clear cover of 25mm. Design the beam by LSM, if it is subjected to total bending moment of 160kNm. Use M20 grade of concrete and Fe415 grade of steel. Compare the design with that obtained by WSM. **[12]**

c) Draw strain and stress distribution diagrams with all parameters for the design of RCC section of flexural member using LSM. **[5]**

Q3) Design the slab S9 and S10 only for flexure by LSM. Refer the centerline plan given in fig. 1. **[25]**

Consider live load = $3kN/m^2$,

Floor finish = $1.5\ kN/m^2$

Use M25 grade of concrete and Fe415 grade of steel.

Draw neat sketches showing details of reinforcement.

OR

Q4) Design dog legged staircase from plinth level to the first floor level for the following data: **[25]**

Floor to floor height = 3450mm

Rise = 150mm; Tread = 300mm

No of risers in first flight = 11

No of risers in second flight = 12

Width of stair = 1 m

Clear Landing width at midlanding and first floor level = 1 m

At plinth level, plinth beam is provided below first step, whereas at midlanding level and first floor level beam is provided at the outer face of landing. Show detailed load calculations and reinforcement details in sectional elevation.

SECTION - II

Q5) A continuous R.C.C. floor beam is simply supported at A and C and continuous over support B, span AB = 7m and BC = 5 m. The beam carries a dead load of 20kN/m (inclusive of self weight) and live load of 12 kN/m. The beam supports one way slabs of span 3m on either side of it. Calculate the support moment at B and maximum span moments of span AB and BC, using 25% redistribution of moments. Draw bending moment diagram and design the beam only for flexure. Draw longitudinal section showing all details.

Material- Concrete of grade M25, Fe500 reinforcement. **[25]**

OR

Q6) a) A reinforced concrete beam has the following data:

Clear Span of beam = 5 m, Width of supporting columns = 300mm, Beam section = 230 x 450mm,

Ultimate UDL on beam = 50kN/m, inclusive of self weight.

Reinforcement at top – 2 Nos of 12mm diameter bars

Reinforcement at bottom – 2 Nos of 16mm diameter bars through + 2nos of 12 mm diameter bars curtail.

Design the shear reinforcement using vertical stirrups. Draw neat diagram showing zoning.

Material- Concrete of grade M20, Longitudinal reinforcement- Fe415 HYSD,

Shear reinforcement- Fe250. **[20]**

b) What do you understand by "redistribution of moments" as applied to R.C. structures. ? What are its advantages? **[5]**

Q7) Design column C10 as axially loaded short column for G+2 building with isolated trapezoidal footing for the following data. Refer fig. 1

Floor to floor height = 3.2m

Height of plinth above ground level = 1.2m

Depth of foundation below ground level = 1.5m

Live load on all slabs = 3kN/m^2

Floor finish load on all slabs = 1.5kN/m^2

Thickness of slab = 140mm

Thickness of wall on all beams = 230mm

Height of parapet wall = 1 m

Size of all beams = 230 x 450mm

S.B.C. of soil = 180 kN/m^2

Material- Concrete of grade M25, Fe500 HYSD reinforcement. Detailed load and design calculations are expected. Draw neat sketches giving reinforcement details of column and footing. **[25]**

OR

Q8) Design a rectangular column subjected to a working load of 800 kN and working moment of 62kNm about major axis and 16kNm about minor axis. The unsupported length of column is 4.5m. Assume both ends of column fixed. Also design its footing considering axial load and moment about major axis only. Take S.B.C. of soil = 200 kN/m^2. Use M20 concrete and Fe415 steel. Detailed calculations and sketches are expected. (Use given charts) **[25]**

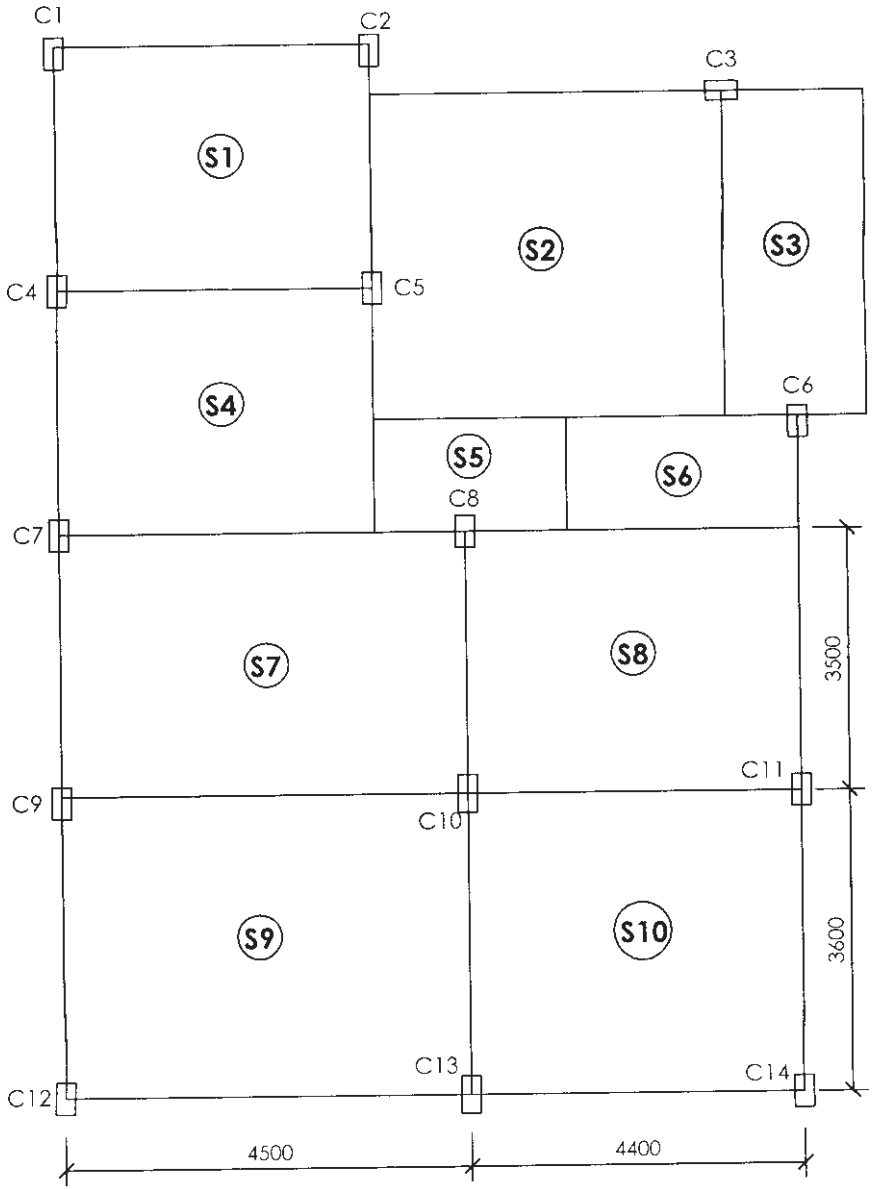
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FIG.1 (Q.3 & Q 7)

Chart 44 COMPRESSION WITH BENDING – Rectangular Section – Reinforcement Distributed Equally on Four Sides

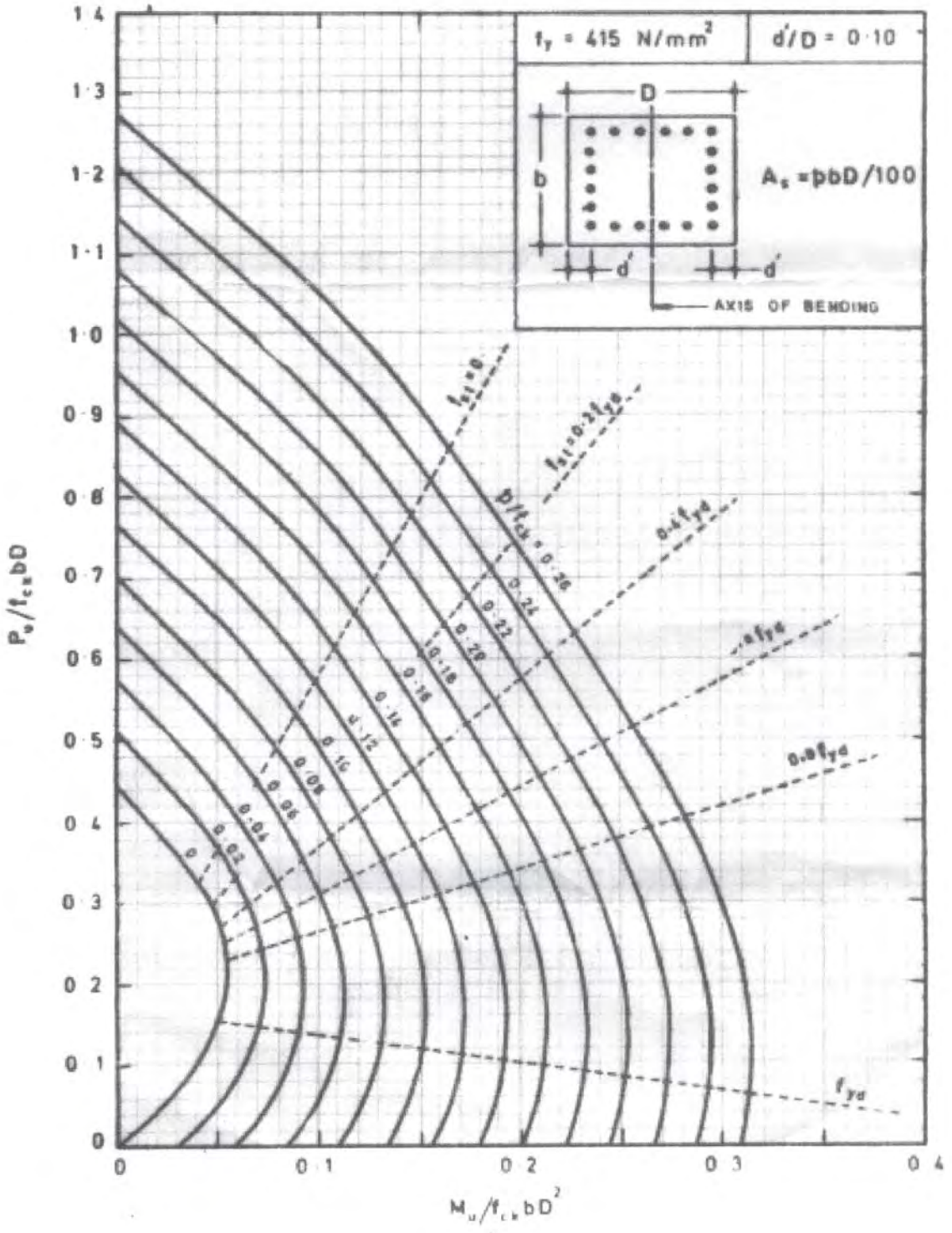


Chart 45 COMPRESSION WITH BENDING – Rectangular Section – Reinforcement Distributed Equally on Four Sides

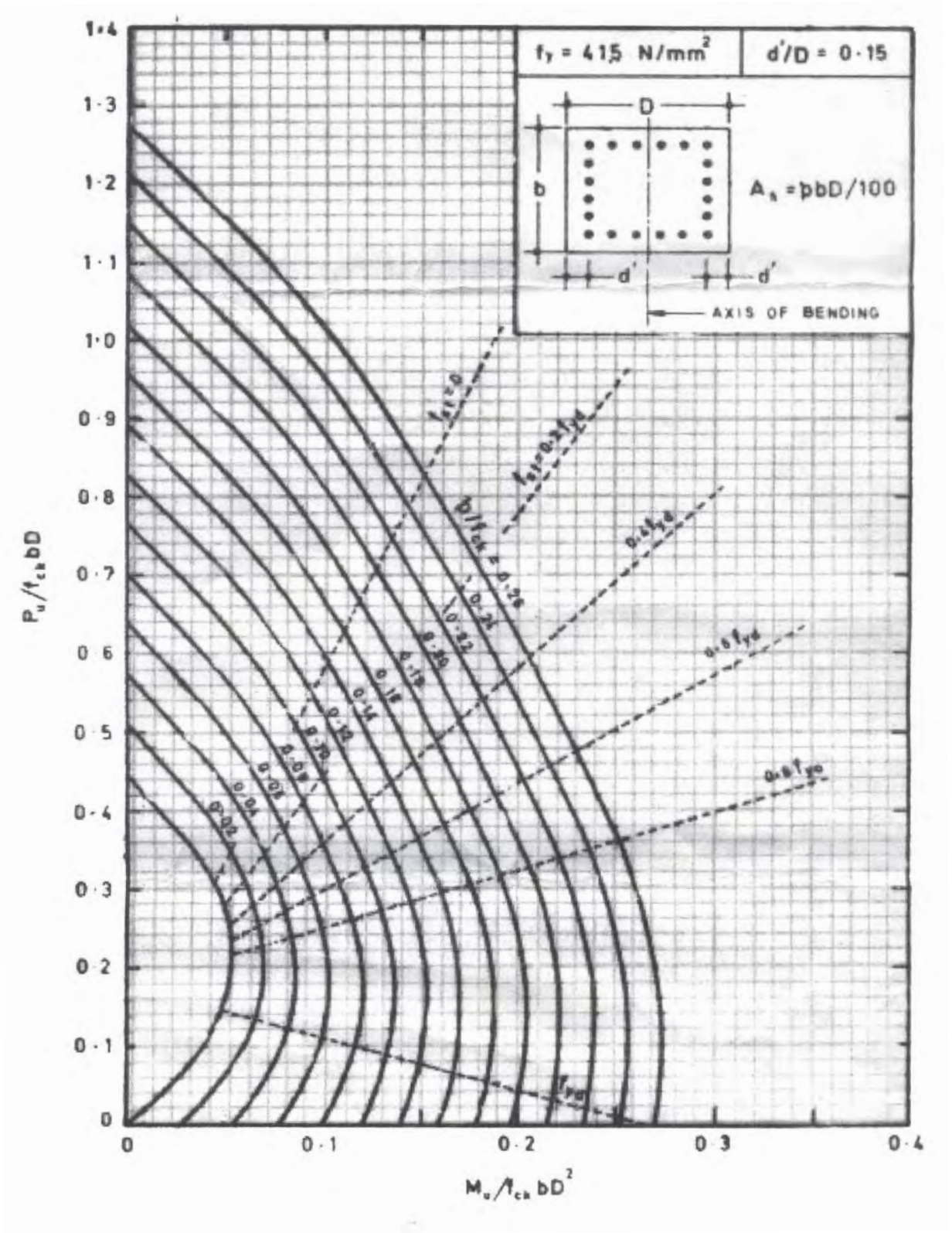
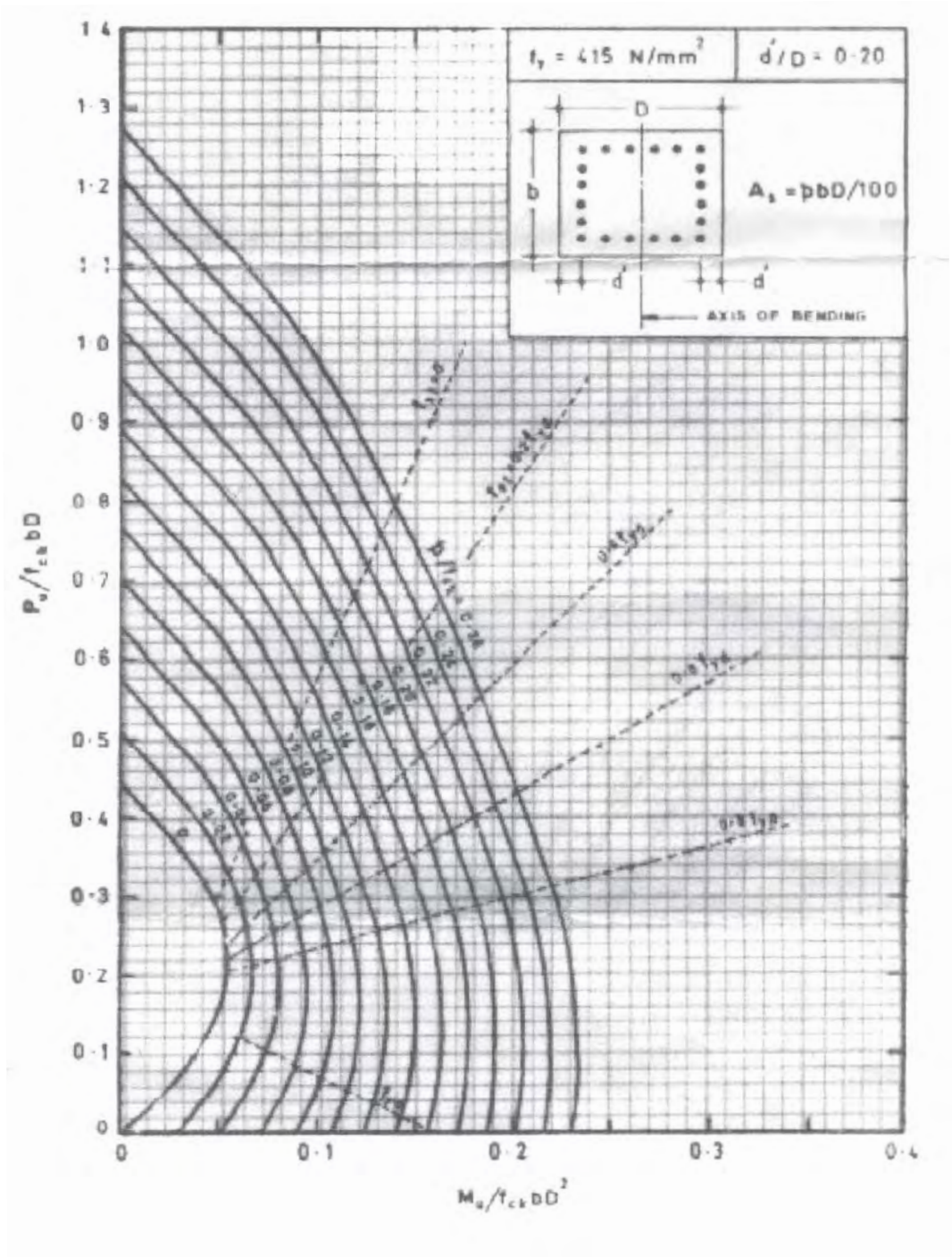


Chart 46 COMPRESSION WITH BENDING – Rectangular Section – Reinforcement Distributed Equally on Four Sides



COMPRESSION MEMBERS

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