Total No. of Questions :12]

SEAT No. :

**P2837**

[Total No. of Pages :7

# [4958]-1009
# T.E. (Civil)
# STRUCTURAL DESIGN -II
## (2012 Course) (Semester - II) (End - Semester) (301010)

*Time : 3 Hours]* *[Max. Marks :70*

***Instructions to the candidates:***

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8 and Q9 or Q10, Q11 or Q12.***
2) ***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) ***Assume any other data, if necessary.***

***Q1)*** a) Explain the meaning of balanced section with respect to WSM and LSM. **[3]**

b) Describe modes of failures of concrete beam. **[3]**

OR

***Q2)*** Design a R.C.C Beam subjected to bending moment of 75 kN-m, using M20 and Fe415. Keep the depth of beam twice the width of beam. Use WSM. **[6]**

***Q3)*** A simply supported beam over a span of 6 m carries a UDL of 40 kN/m throughout if the size of the beam is restricted to 230 x 525 overall and effective cover for reinforcement is 40 mm using M20 and Fe 415, design the suitable reinforcement for the beam using LSM. **[8]**

OR

***Q4)*** A T-Beam has the following details **[8]**

a) Width of flange = 1150 mm

b) Depth of flange = 110 mm

***P.T.O.***

c) Width of rib = 300 mm

d) Effective depth = 500 mm

e) Tension steel - 4 No's 25 mm dia

Material - M20 and Fe 500 Using LSM, Find

i) Position of neutral axis

ii) Type of section

iii) Ultimate flexural strength

***Q5)*** The center line plan of a typical floor of residential building is as shown in Fig.1. Design the cantilever slab panel S3 only for flexure by L.S.M. **[6]**

Draw neat sketches showing details of reinforcement.

a) Take live load = 4 kN/m$^2$

b) Floor finish = 1.5 kN/m$^2$

c) Materials: M25 and Fe 415

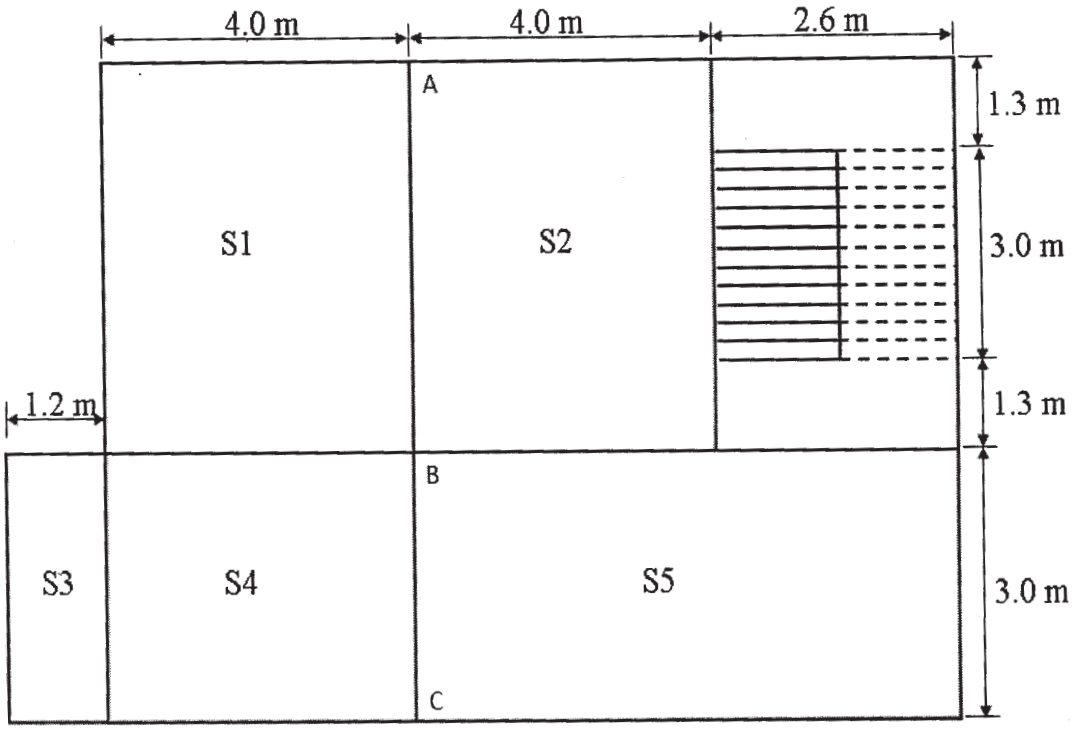



**Fig 1: Center line plan of a typical floor of building**

OR

***Q6)*** Design slab panel S4 as shown in Fig. 1 only for flexure. Use same data in Question 5. Draw neat sketches showing details of reinforcement. Use LSM. **[6]**

***Q7)*** Design a continuous beam ABCDE (AB = BC = 3.25 m and CD = DE = 3.5m) for flexure and shear using IS code method for following data: LSM is recommended **[16]**

Dead load = 18 kN/m

Live load = 12 kN/m

Grade of concrete = M 20

Grade of steel = Fe 415

Draw details of reinforcement at mid span and at continuous support.

OR

***Q8)*** a) Design reinforcement required for a rectangular RC beam section for following data: **[10]**

Size of beam (b X D) = 300 mm X 450 mm

Factored shear Vu = 50 kN.

Factored bending moment Mu = 85 kN -m

Factored torsional moment Tu = 35 kN -m

Grade of concrete = M 20 Grade of steel = Fe 415

Draw the detail of reinforcement

b) A RCC beam of size 230 x 525 mm overall having clear cover of 25mm is reinforced with 3 no's 16 mm dia bars throughout and 2 no's of 12 mm dia curtailed is provided over a span of 5 meter along with 8 mm dia two legged stirrups about 175 mm c/c throughout by using M20 and Fe 415 calculate what ultimate UDL the beam can carry including self weight. **[6]**

***Q9)*** Design a continuous floor beam ABC as shown in Fig. 1 for flexure and shear using 15% redistribution of moments using LSM. Thickness of the all floor slab is 150 mm; live load and floor finish load on all slabs are 4.0 kN/$m^2$ and 1.5kN/$m^2$, respectively. The wall on this beam is 230 mm thick and 2.75 m high. Use M 20 and Fe 415 steel. Show details of load calculations, bending moment envelop and main and shear reinforcement. **[18]**

OR

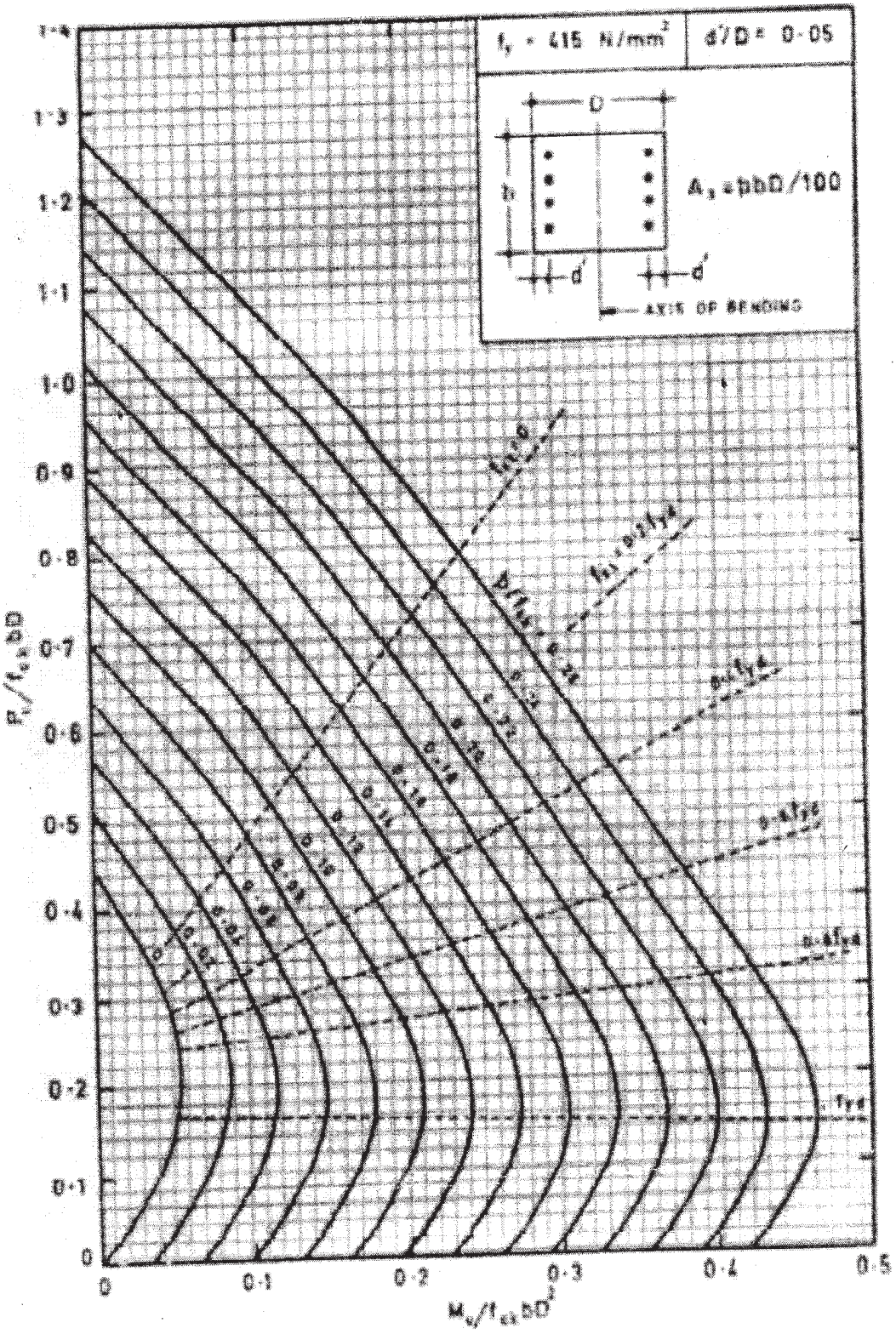
***Q10)*** Design a rectangular column and its footing subjected to working axial load of 700 kN, along with a working moment of 75 kN -m about an axis bisecting the depth. The unsupported length of column is 3.5 m. Assume column is effectively held in position and restrained against rotation. Grade of concrete is M 20 and steel as Fe 415. Take SBC of strata as 200kN/sq-m. Use charts for column design. **[18]**

***Q11)*** Design an axial loaded short column and its Isolated footing carrying axial load of 1200 kN, the column is having unsupported length as 3.3 m and both ends hinged assume M20 and Fe500 and SBC of soil as 200kN/sq-m. **[16]**

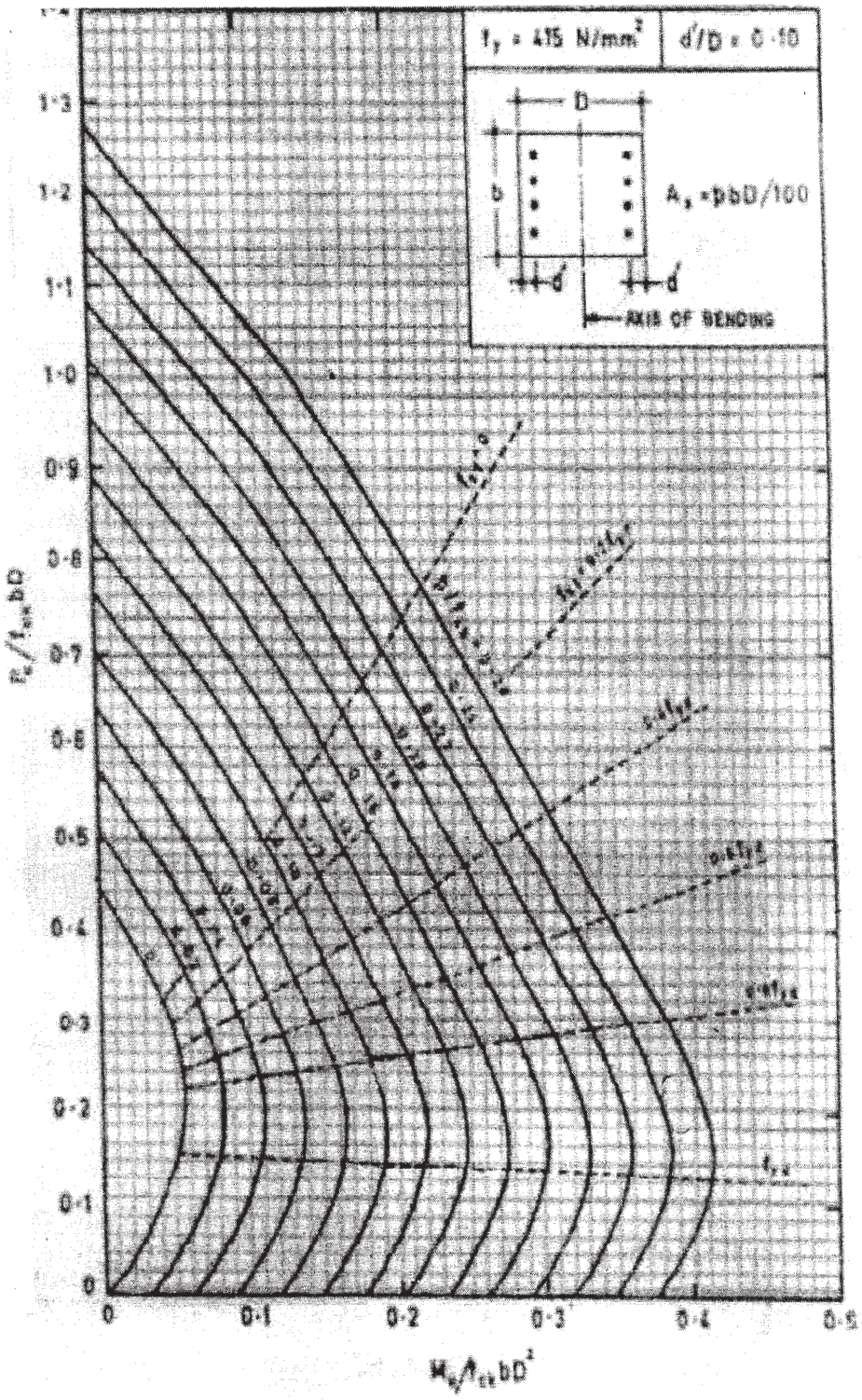
OR

***Q12)*** Design a short column to carry working load of 1000kN and working moment of Mx = 100kN-m and My = 25 kN-m acting about axis bisecting the depth and width of column respectively the unsupported length of column is 4.5 m assuming both ends of columns are fixed. Also design the footing considering axial load and moment about major axis only. Take SBC of soil as 210kN/sq-m. Use M 20 and Fe415. Show detail calculations and details of Reinforcements. **[16]**

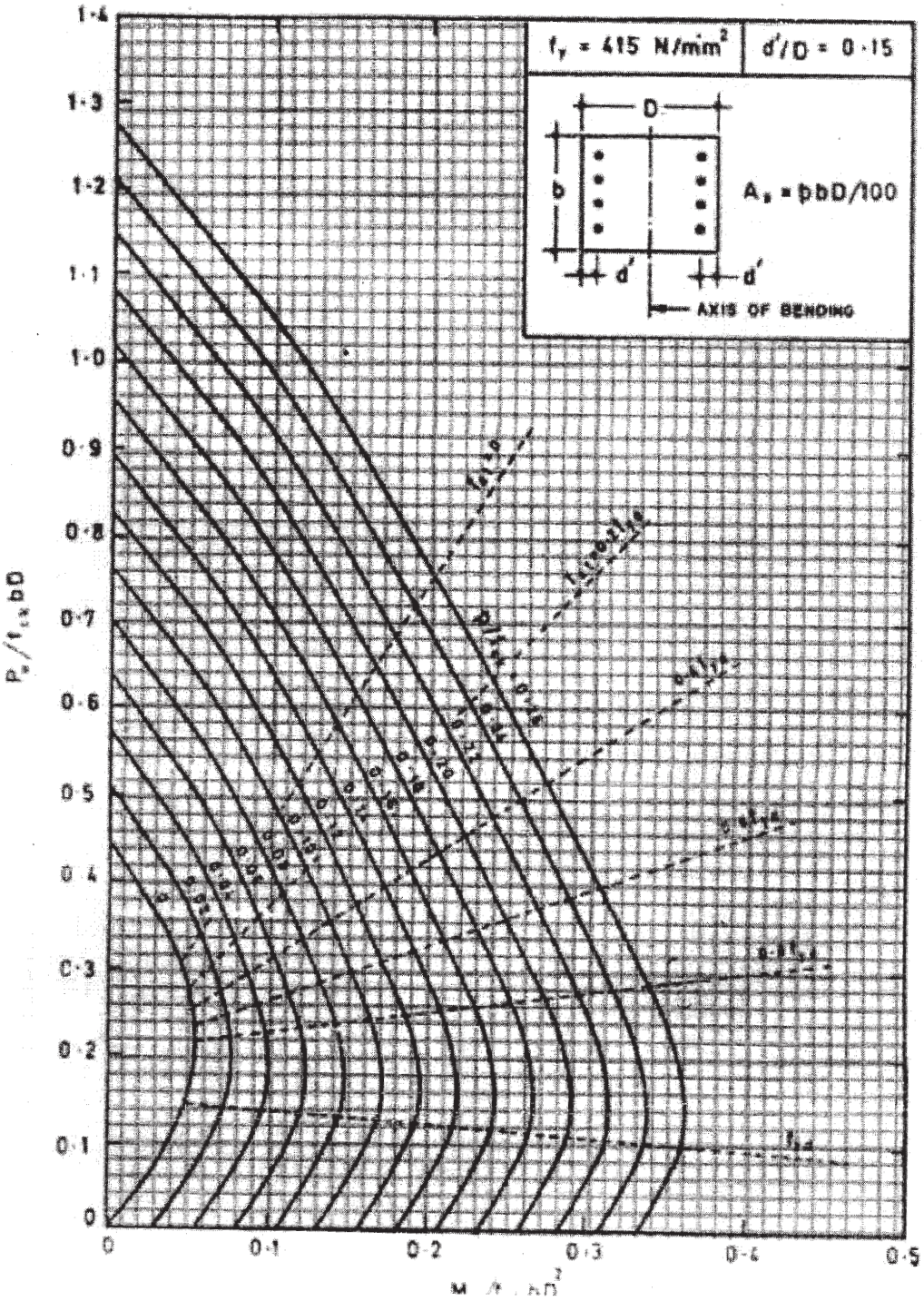
## SP 16 Chart 31 COMPRESSIONS WITH BENDING – Rectangular Section – Reinforcement Distributed Equally on Two Sides



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



**SP 16 Chart 33 COMPRESSIONS WITH BENDING – Rectangular Section – Reinforcement Distributed Equally on Two Sides**

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