Total No. of Questions : 12]

SEAT No. :

P3246

[Total No. of Pages : 6

[5353] - 109
T.E. (Civil) (Semester - II)
STRUCTURAL DESIGN - II
(2012 Pattern)

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

Instructions

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) ***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) Explain the term partial safety factors in limit state method and why these are called as partial? **[3]**

b) Compare under reinforced section with over reinforced section **[3]**

OR

Q2) A doubly reinforced RC section 300 mm X 450 mm overall is reinforced with 5 no 20 mm diameter bars on tension side and 3 no 20 mm diameter of 20 mm diameter bars on compression side. The clear cover is 25mm for both the reinforcement. Calculate the moment of resistance of this section using WSM approach. Use M20 grade of concrete and Fe 250 grade of steel. **[6]**

Q3) Derive the design constants: k =Neutral axis constant, R = Moment of resistance constant and pt = % steel constant for a singly reinforced balanced section having concrete grade as M20 and steel grade as Fe 415. Use LSM approach.**[8]**

OR

Q4) Calculate the ultimate moment of resistance of L - beam for the following data: **[8]**

P.T.O.

Width of flange, d_f = 1200mm

Depth of slab, D_f = 100mm

Width of web, b_w = 300 mm

Effective depth, d = 600 mm

Area of tension reinforcement, A_{st}, = 5 no 25 mm diameter bar

Grade of concrete = M 20

Grade of steel = Fe 500

Q5) In a multistoried commercial building, a cantilever porch of size 2.4 m wide and 5.2 m long is to be provided at a height of 2.2 m above the floor level. This porch slab which overhangs 2.4 m beyond the face of beam is to be cast in flush with bottom face (soffit) of beam. Design this porch slab. Take live load = 1 kN/m^2, floor finish = l kN/m^2. Use M20 grade of concrete and Fe 250 steel. Draw neat sketches showing details of reinforcement. **[6]**

OR

Q6) A R.C. slab is to be provided for a room measuring 5.2 m X 4.7 m. The slab is to be casted monolithically over the 300 mm wide beam with corners of slab held down. The slab carries live load of 3.5 kN/m^2 and floor finish of 1 kN/m^2. Design a RC slab using M20 grade of concrete and Fe 415 grade of steel. Also show details of reinforcement. **[6]**

Q7) a) Explain following with reasons: **[4]**

i) Why minimum shear reinforcement is required to be provided in beams?

ii) Why IS: 456 - 200 specifies an upper limit on maximum value of τ_c?

b) A rectangular RC beam is 230 mm X 400 mm effective. At a particular section it has 0.9% tension steel and is provided with 8 mm ϕ, 2 - legged vertical stirrups @ 150 mm c/c. Calculate shear resistance of stirrups, shear resisted by concrete and total shear resistance of cross section. Use M20 grade of concrete and Fe 250 steel. **[10]**

OR

Q8) A rectangular RC beam 230 mm X 600 mm overall is subjected to factored sagging bending moment of 60 kNm, factored shear force of 45 kN and factored twisting moment of 18 kNm. Design the reinforcement for given section using M20 grade of concrete and Fe 250 steel. Assume effective cove as 35 mm. **[14]**

Q9) Design a Continuous beam ABCD (AB = BC = CD 4.0 m) for flexure and shear using IS code method for following data: **[18]**

Dead load=20 kN/m

Live load = 15 kN/m

Grade of concrete = M 20

Grade of steel = Fe 415

Also detail the reinforcement.

OR

Q10)a) What are advantages of redistribution of moments? **[4]**

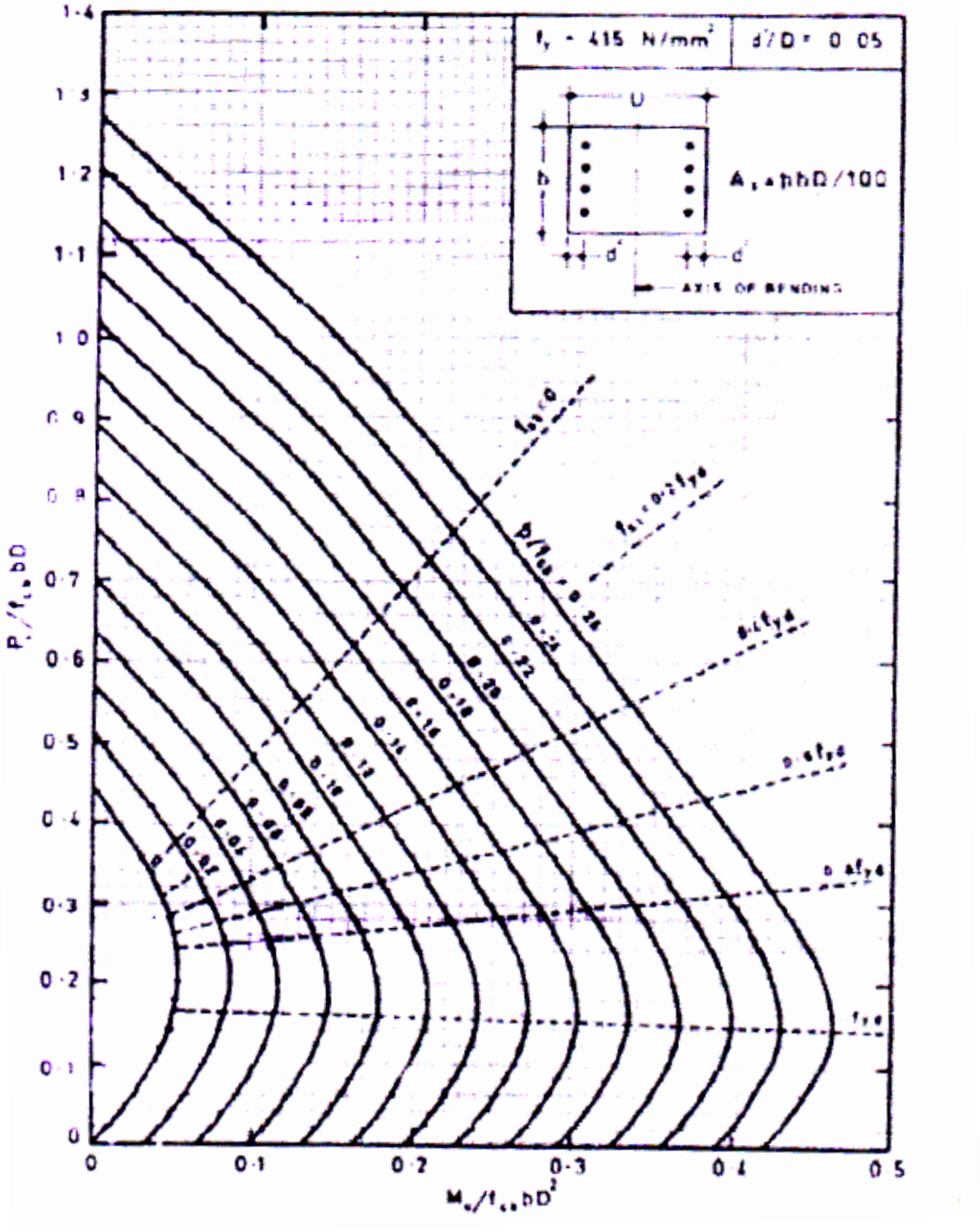
b) A rectangular RC beam 300 mm X 600 mm overall is fixed at one end and simply supported at the other end. It has a span of 6 m. It carries working superimposed load (exclusive of self weight) of 42 kN/m. Design the reinforcement at fixed support and near mid-span for following two cases: a) without allowing redistribution of moment; b) allowing 30% redistribution of moments. Use M20 grade of concrete. Fe 415 steel and effective cover of 35 mm. **[14]**

Q11)Design a short RC column of 3.00 m effective length to resists an axial ultimate load of 1500 kN. Also design footing for this column if safe bearing capacity of soil is 200 kN/m^2. Show detail design calculations and reinforcement details in plan as well as in sectional elevation. Use M20 concrete and Fe 250 steel.**[18]**

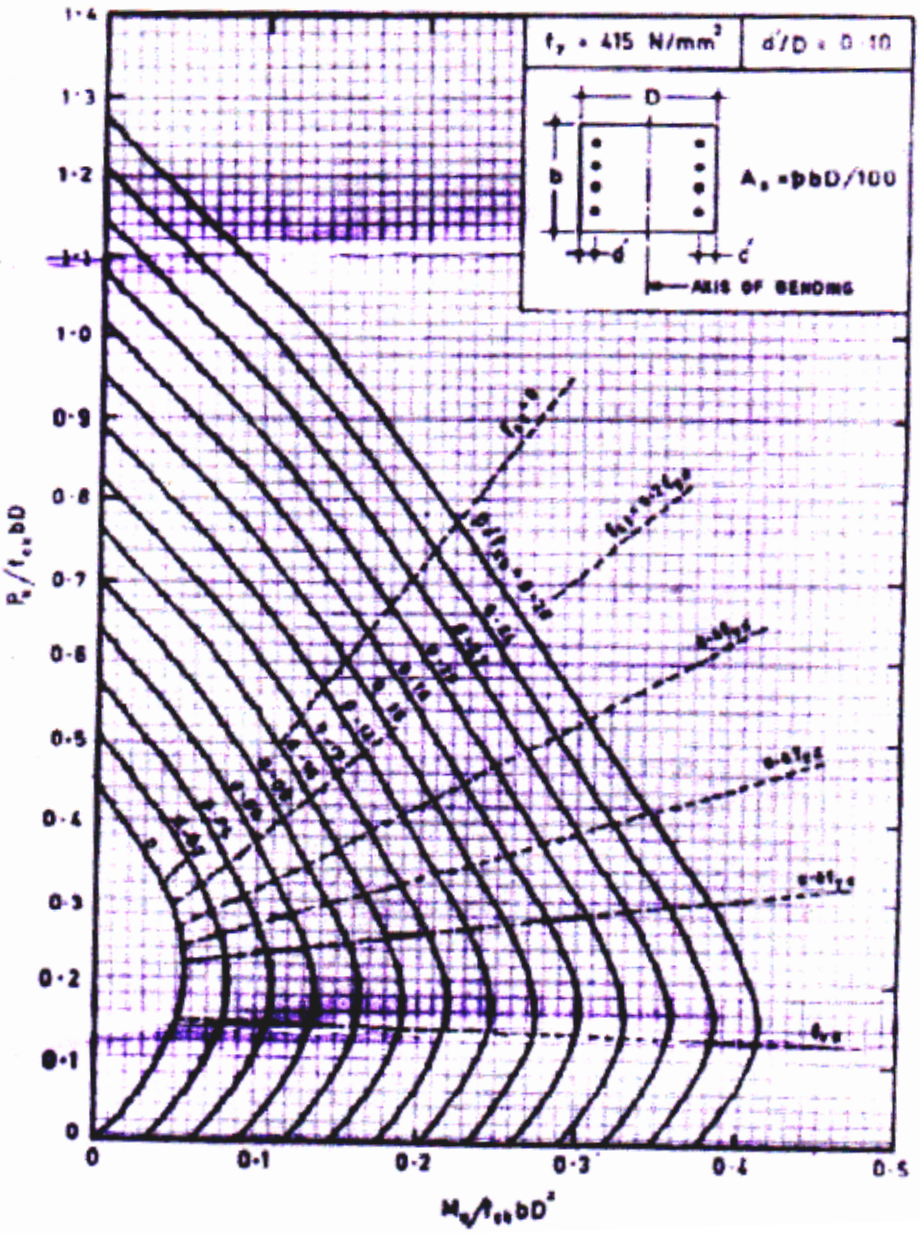
OR

Q12)Design a short RC column of rectangular section to carry to carry an ultimate load of 750kN and ultimate moment of 100 kNm acting along an axis bisecting the depth of the column, Assume effective length of column as 4. 5 m and width of column as 300 mm. Use M20 grade of concrete and Fe 415 steel. Provide equal reinforcement on both sides. Also design footing for this column if safe bearing capacity of soil is 200 kN'm^2. Show detail design calculation and reinforcement details in plan as well as in sectional elevation. **[18]**

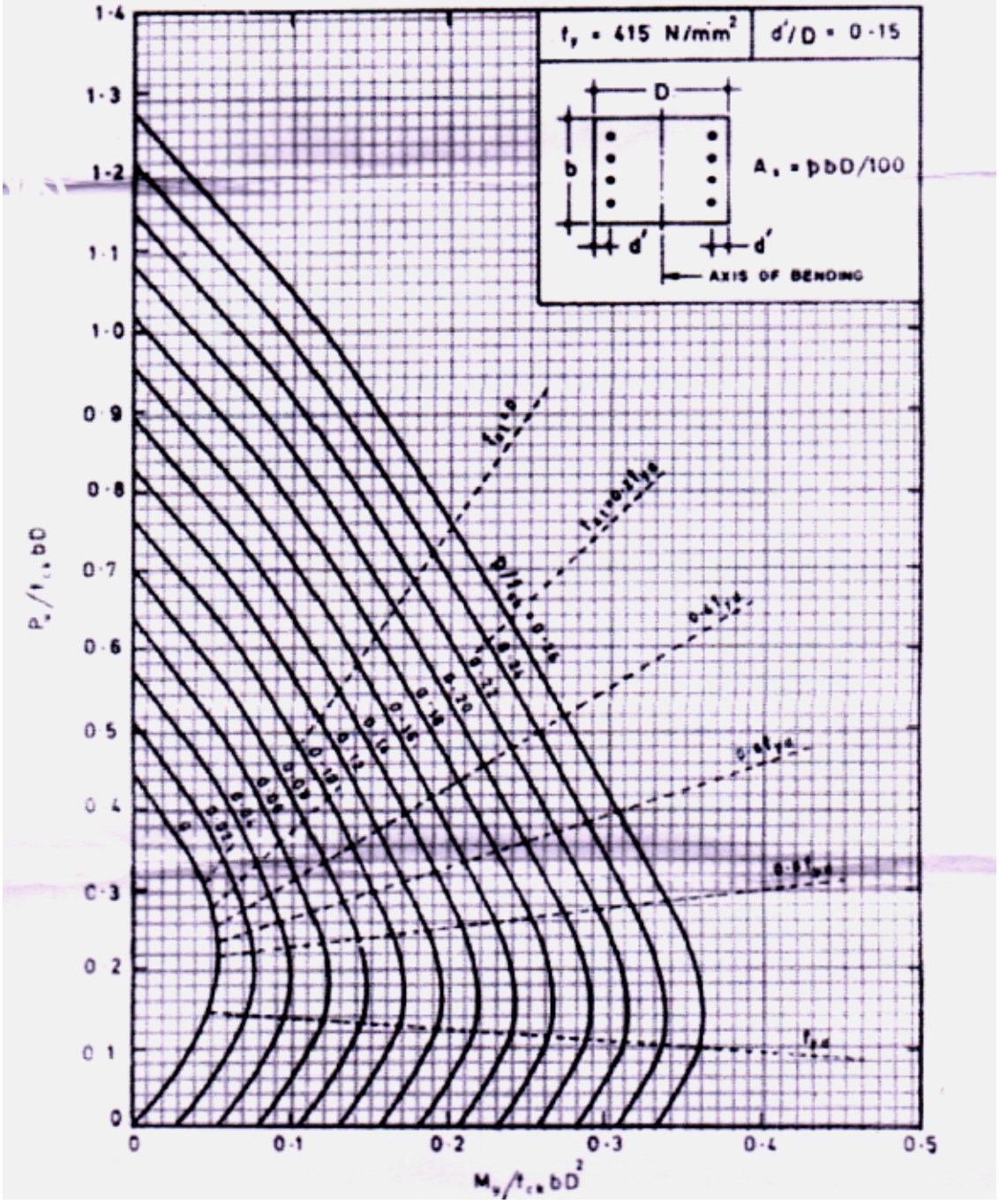
SP 16 Chart 31 COMPRESSION WITH BENDING – Rectangular Section – Reinforcement Distributed Equally on Two Sides



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



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



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