Total No. of Questions : 12]

SEAT No. :

P3950

[Total No. of Pages : 6

[5253]-109

T.E. (Civil Engineering)

STRUCTURAL DESIGN - II

(Semester - II) (2012 Pattern)

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

Instructions to the candidates:

1) ***Attempt Q1 or Q2, Q,3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10 and Q11 or Q12.***
2) ***Figures to the right Indicate full marks.***
3) ***Neat diagrams must be drown wherever necessary.***
4) ***Use of IS 456-2000 and non programmable calculator is allowed.***
5) ***Mere reproduction from IS code as answer; will not be given full credit.***
6) ***Assume suitable data, if necessary.***

Q1) a) State the functions of longitudinal and transverse reinforcement in columns. **[3]**

b) Explain with sketches, why does continuous T-beam at support have to be designed as rectangular section? **[3]**

OR

Q2) Draw strain and stress distribution diagrams with all parameters for the design of under reinforced section of flexural member using L.S.M. Also obtain the equations of **[6]**

i) Depth of neutral axis.
ii) Ultimate moment of resistance from compression in concrete.
iii) Ultimate moment of resistance from tension in steel.

Q3) Calculate the moment of resistance safe imposed UDL (by LSM) that the simply supported beam can carry for flanged beam section detailed as below **[8]**

i) Width of rib = 300mm
ii) Effective flange width = 1500mm
iii) Thickness of flange = 130mm
iv) Effective depth = 410mm
v) Tension steel = 2 – #20 through plus 2 – #16 curtail at midspan.
vi) Use M25 grade of concrete and Fe 500 grade of steel.

OR

P.T.O.

Q4) A rectangular, singly reinforced beam, 230mm wide and 567mm effective depth is used as a simply supported beam over an effective span of 7m. The reinforcement consists of 4 bars of 16mm diameter at tension face, If the beam carries a Load of l4kN/m. inclusive of its self weight. Determine, the stresses developed in concrete and steel using WSM. Use M20 concrete and Fe415 steel, **[8]**

Q5) Design continuous one way slab of four span - S1, S2, S3 and S4 with clear short spans 3.0m, 3.2m 3.4m and 3.1m in, respectively. The slabs are supported by beams of width 230mm along all the edges. The slab is subjected to floor finish of 2kN/m^2 and live load 4kN/m^2. Use Concrete of grade M25 and Fe 500 reinforcement for moderate exposure condition. Draw details of reinforcement. **[12]**

OR

Q6) Design flight I and II of open well staircase for following data:

Riser = 150mm, Tread = 250mm, Clear size of staircase hall is 3.5 × 4.25m.

No. of risers: Flight I : 8 nos; Flight II : 5 nos; Flight III : 8 nos.

Width of Stair and landing = 1500mm, Flights I and III are with landing only on one side, whereas Flight II is with landing on both sides.

Material M25 & Fe500, Width of all beams is 230mm.

Draw the reinforcement details in sectional elevation for both flights. **[12]**

Q7) Continuous RC beam ABCD of rectangular section is simply supported at A and D and continuous over support B and C. Span AB = 6.0m. BC = 4.0m and CD = 7.0m. The beam carries dead load of 20 kN/m (including its self weight) and live load of 17 kN/m. The beam supports 120mm slab on both sides. Calculate design moment for span BC after 22% redistribution of moments by considering proper load case. Design span BC for flexure and shear. Draw the reinforcement details.

Material- Concrete of grade M25, Fe 500 reinforcement. **[12]**

OR

Q8) Design a continuous beam ABCDE for flexure only using IS Code coefficients. AB=BC=CD=DE = 4.5m. The beam supports 120mm slab on both sides. The beam carries dead load of 24 kN/m (including its self-weight) and live load of 12 kN/m.

Take material M30 and Fe500. Show the reinforcement detail in longitudinal section and cross-section at continuous support and at mid span. **[12]**

Q9) A rectangular RC beam of span 6m. size 230 mm × 450 mm with effective cover 36mm is subjected to following actions:

I) Factored BM = 86 kN.m

II) Factored SF = 90 kN

III) Factored Torsional Moment = 36 kN.m

Design the beam for flexure and shear using M 20 & Fe 415 grade materials. **[16]**

OR

Q10) Design an axially loaded short column to carry a working load of 1000 kN. The unsupported length of column is 3.6m. The column is fixed at both the ends. Also design the footing for this column only for flexure and one way shear. Take SBC = 240 kN/m^2.

Material M 30 and Fe 500 used. Show detailed load and design calculations and reinforcement details in plan and sectional elevation. **[16]**

Q11) Design a bi-axial rectangular short column with material M25 and Fe 500 to carry a working load of 800 kN. Working moment of 100 kN-m about major axis bisecting the depth of column and 50 kN-m about minor axis bisecting the width of column. The unsupported length of column about major and minor axis is 3.4m and 3.1m. The column is fixed at one end and hinged at the other. Show detailed design calculations and reinforcement details. **[16]**

OR

Q12) Design an uniaxial square short column with material M25 and Fe 500 to carry ultimate load of 1000 kN and working moment of 120 kN-m about major axis bisecting the depth of column. The unsupported length of column is 4.2m, The column is fixed at one end and hinged at the other. Also design the footing for this column only for flexure and punching shear. Take SBC = 200 kN/m^2, Show detailed design calculations and reinforcement details in plan and sectional elevation. **[16]**

Chart - 13 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.

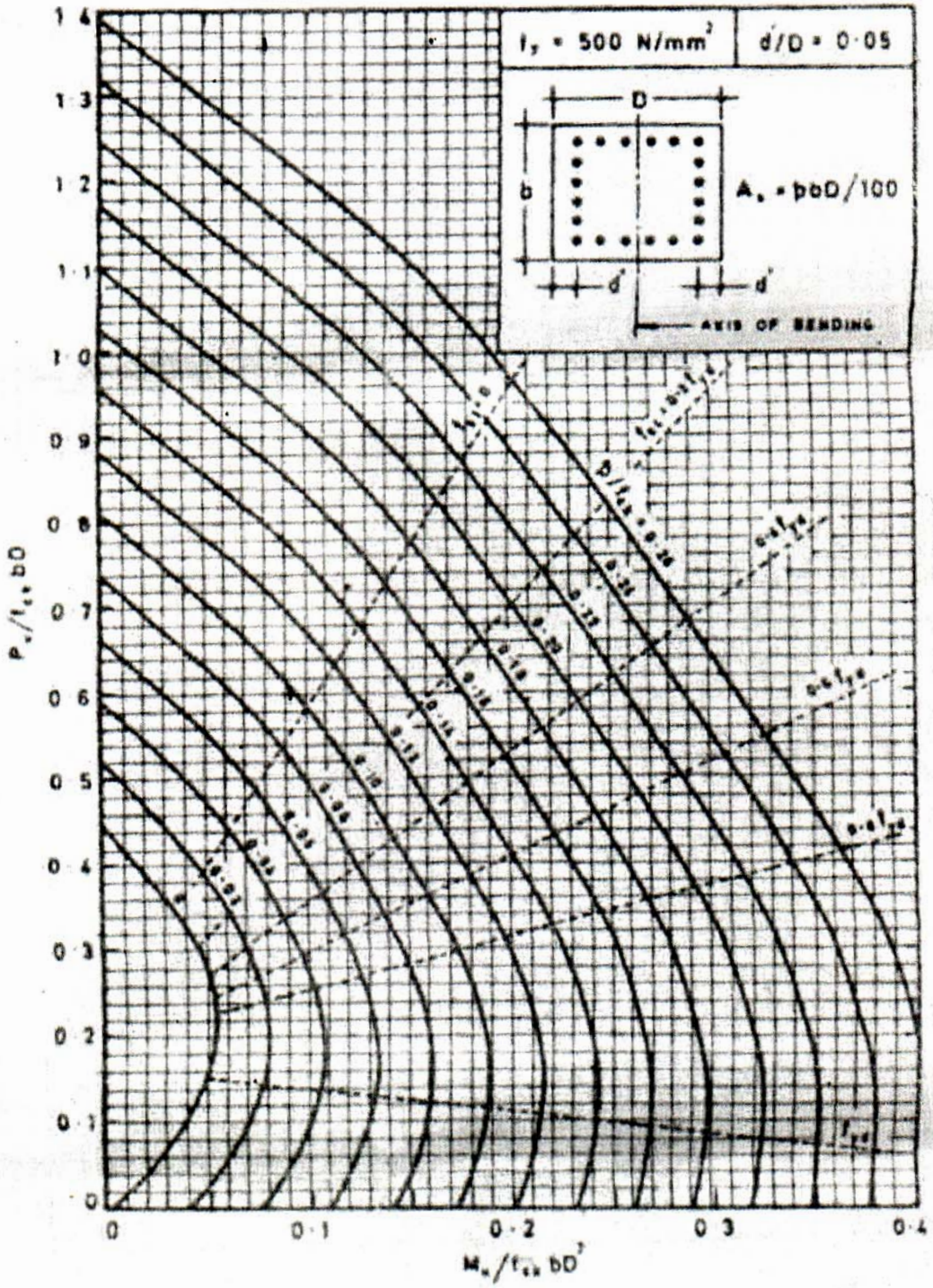

Chart - 14 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.

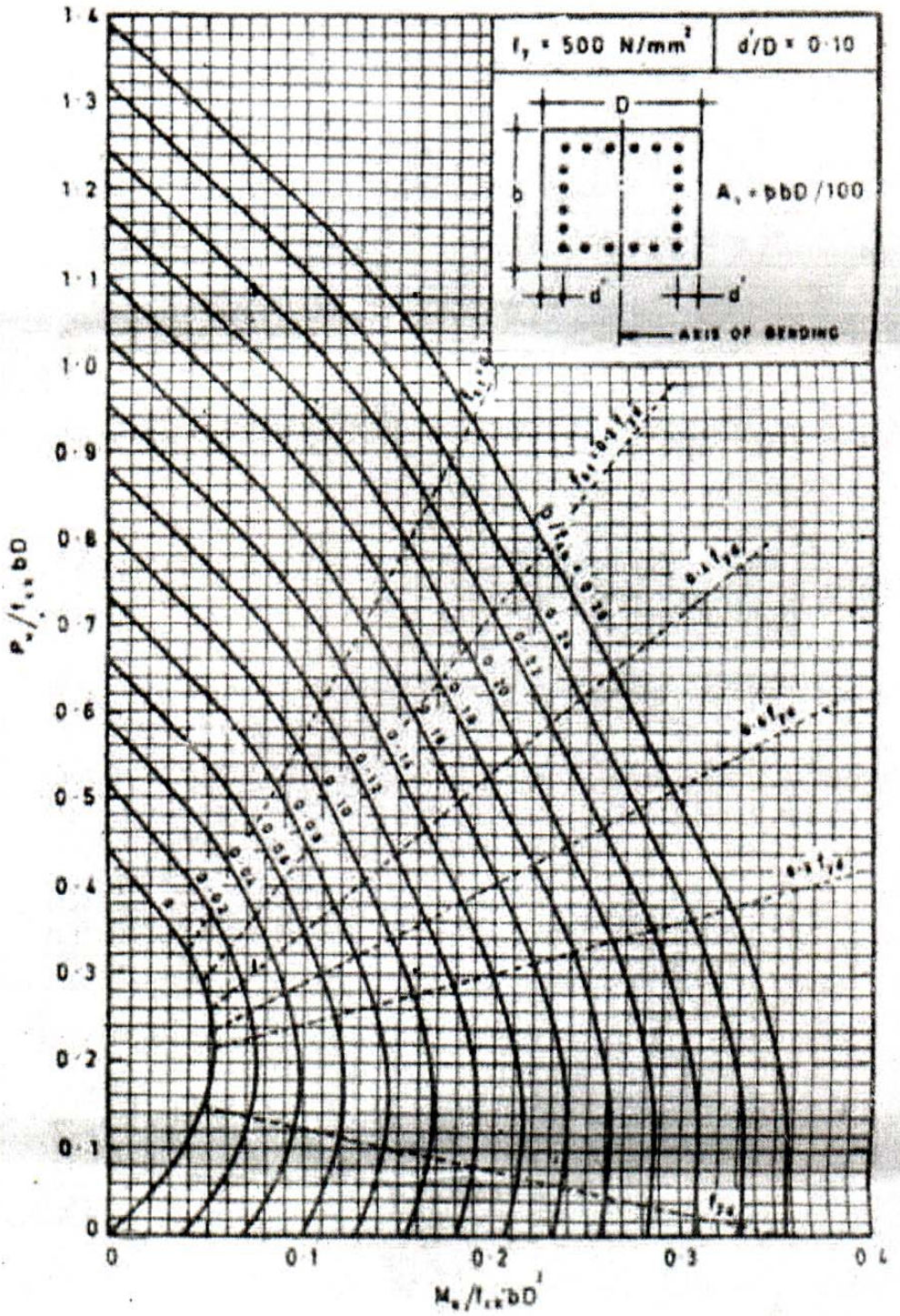

Chart - 15 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.