Total No. of Questions : 12]

SEAT No. :

P1518

[Total No. of Pages : 5

[5460]-109
T. E. (Civil Engineering)
STRUCTURAL DESIGN - II
(2012 Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***Attempt 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, Q.11 or Q.12.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of IS 456-2000 and non programmable calculator is allowed.***
5) ***Mere reproduction from IS code as answer, will be given full credit.***
6) ***Assume suitable data, if necessary.***

Q1) a) Draw strain and stress distribution diagrams with all parameters for the design of RCC section of flexural member using LSM. **[3]**

b) Draw stress strain curves for concrete in LSM and explain stress and strain values associated with the curves. **[3]**

OR

Q2) Explain the terms bond stress and development length. Calculate development length for 16 mm diameter bar in compression and tension by both method's (WSM and LSM). Use M25 concrete and Fe 500 steel. **[6]**

Q3) A calculate the moment of resistance by LSM for flanged beam section detailed as below : **[8]**

a) Width of rib = 230mm

b) Effective flange width = 1450mm

c) Thickness of flange = 115mm

d) Effective depth = 450mm

e) Tension steel = 2 – #16 through plus 2– #12 curtail at midspan.

f) Use M20 grade of concrete and Fe 415 grade of steel.

OR

Q4) A rectangular beam section, 230mm wide and effective depth 415mm is reinforced with 4 bars of 16mm diameter in the tensile zone and 2 bars of 16mm in the compression zone. Determine moment of resistance of the section using WSM. Use M20 grade of concrete and Fe 415 grade of steel. **[8]**

P.T.O.

Q5) Design a cantilever slab for effective span of 1.7m subjected to floor finish of 2kN/m^2 and live load 3kN/m^2. Use Concrete of grade M20 and Fe 415 reinforcement. Draw details of reinforcement. Check for shear is not required. (Use LSM). **[8]**

OR

Q6) Design a simply supported one way slab for a room with clear inner size 3.5m × 7.8m. The slab is supported by beams of width 230mm along all the edges. The slab is subjected to floor finish of 1.5 kN/m^2 and live load 3kN/m^2. Use concrete of grade M20 and Fe500 reinforcement. Draw details of reinforcement. Check for shear is not required. (Use LSM). **[8]**

Q7) Continuous RC beam ABC of rectangular section is simply supported at A and C and continuous over support B Span AB = 4.0m, BC=5.0m. The beam carries dead load of 20 kN/m (including its self weight) and live load of 16 kN/m. The beam supports 115mm slab on both sides. Calculate design moment for span AB and BC after 15% redistribution of moments by considering proper load case. Design beam for flexure and shear. Draw the reinforcement details. Material-Concrete of grade M25, Fe 500 reinforcement. **[16]**

OR

Q8) Design a continuous beam ABCD for flexure only using IS Code coefficients. AB=BC=CD=4m. The beam supports 120mm slab on both sides. The beam carries dead load of 18 kN/m (including its self-weight) and live load of 15 kN/m. Take material M25 and Fe500. Show the reinforcement detail in longitudinal section and cross-section at continuous support and at mid span. **[16]**

Q9) A rectangular RC beam of span 6m, size 300 mm × 600 mm with effective cover 40 mm is subjected to following actions : **[16]**

i) Factored BM = 150 kN.m

ii) Factored SF = 60 kN

iii) Factored Torsional Moment = 75 kN.m

Design the beam for flexure and shear using M 25 & Fe 500 grade materials.

OR

Q10) Design an axially loaded short column to carry a working load of 700 kN. The unsupported length of column is 3.5 m. The column is held in position and not restrained against the rotation at both ends. Also design the footing for this column only flexure and one way shear. Take SBC = 200 kN/m^2.

Material M 20 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 by limit state method with material M25 and Fe 415 to carry a working load of 900 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 3.8m and 3.4m. 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 by limit state method with material M25 and Fe 415 to carry ultimate load of 800 kN and working moment of 100 kN-m about major axis bisecting the depth of column. The unsupported length of column is 4m. 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 = 210 kN/m^2. Show detailed design calculations and reinforcement details in plan and sectional elevation. **[16]**

Chart 5 : Interaction Diagram for Combined Bending and Compression Rectangular Section-Equal Reinforcement on All Sides

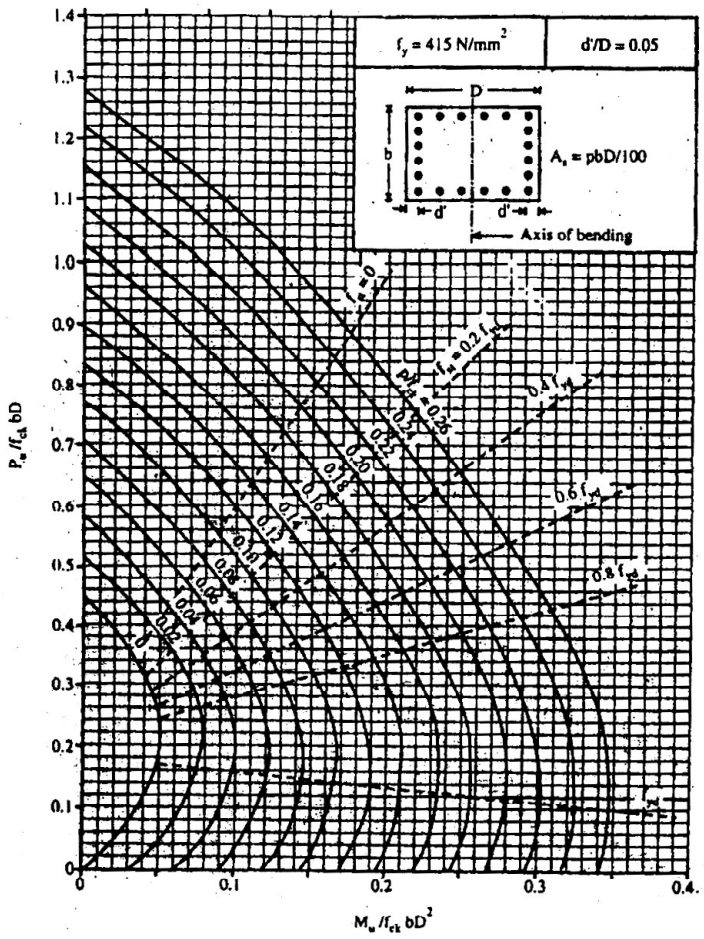

Chart 5

Chart 6 : Interaction Diagram for Combined Bending and Compression Rectangular Section-Equal Reinforcement on All Sides

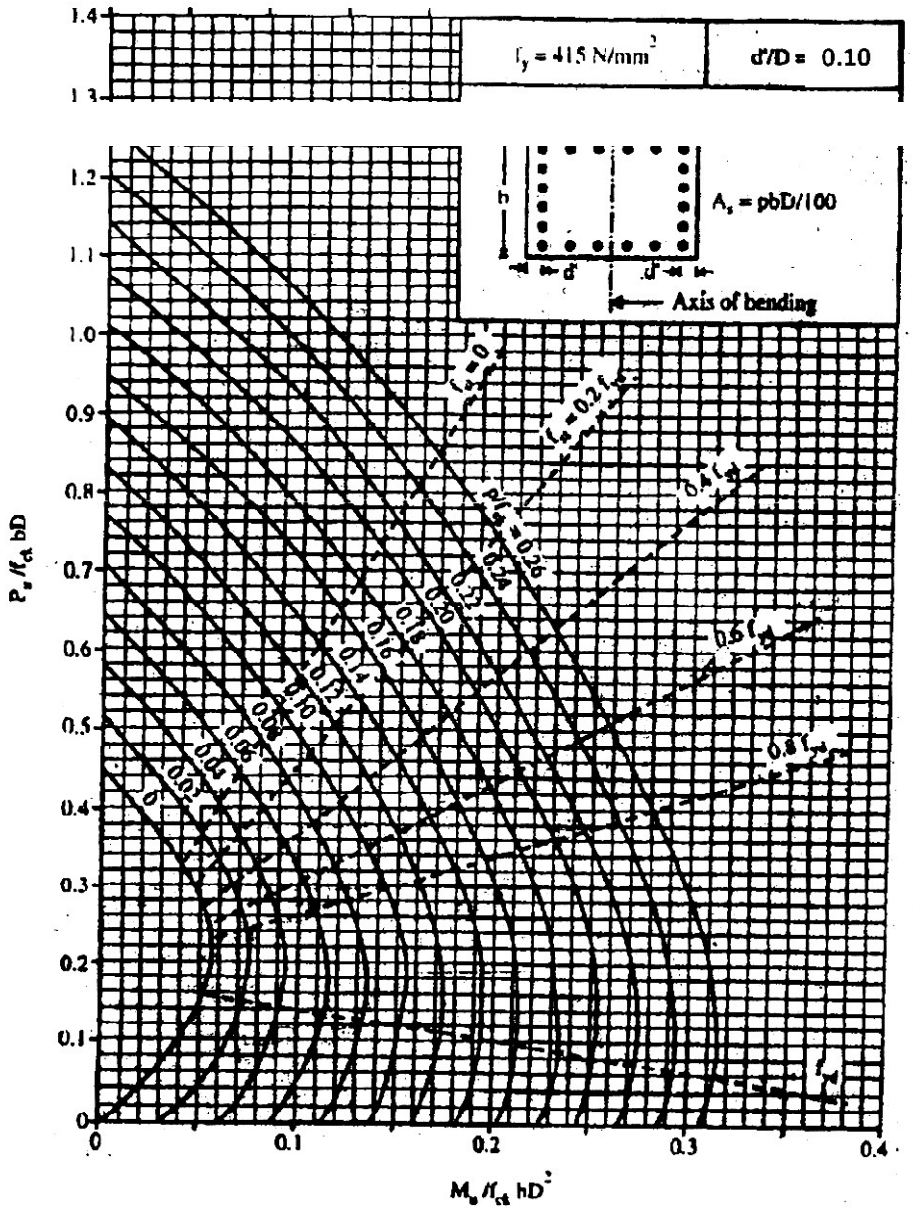

Chart 6

Chart 7 : Interaction Diagram for Combined Bending and Compression Rectangular Section-Equal Reinforcement on All Sides