Total No. of Questions :8]

SEAT No. :

P3892

[Total No. of Pages : 8

[4958]-109
T.E. (Civil Engineering)
STRUCTURAL DESIGN - II
(2008 Course) (Semester - II) (301008)

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

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2 and Q.3 or Q.4 in section - I.***
2) ***Attempt Q.5 or Q.6 and Q.7 or Q.8 in section - II.***
3) ***Answer 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) A rectangular beam section, 230 mm 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 30mm for both the reinforcement. Determine moment of resistance of the section using WSM. Use M25 grade of concrete and Fe 415 grade of steel. **[10]**

b) A reinforced concrete rectangular beam has width 230mm and total depth 600mm with clear cover of 25mm. The beam is reinforced with 3 bars with 20mm diameter at support section at tension side. Calculate the shear strength of the support section if 8mm diameter two legged stirrups are provided at spacing 200mm C/C. Use M20 grade of concrete and Fe 500 grade of steel. Use LSM. **[10]**

c) Explain with neat sketch Balanced, Under reinforced and over reinforced section as per LSM. **[5]**

OR

[redacted]

P.T.O.

Q2) a) Draw stress strain curves for concrete in LSM and explain stress and strain values associated with the curves. **[5]**

b) A Calculate the moment of resistance by LSM for flanged beam section detailed as below. **[10]**

i) Width of rib = 300mm.

ii) Effective flange width = 1500mm.

iii) Thickness of flange = 140mm.

iv) Effective depth = 567mm.

v) Tension steel = 3- #20 through plus 2-#16 curtail at midspan.

vi) Use M25 grade of concrete and Fe 500 grade of steel.

c) Explain the terms bond stress and development length. Calculate development length for 20mm diameter bar in compression and tension by both methods (WSM and LSM). Use M30 concrete and Fe 500 steel. **[10]**

Q3) Design floor slabs S4 and S12 only for flexure and torsion. Refer the structural plan given in fig. 1. Consider live load = 3kN/m^2, Floor finish = 1.0 kN/m^2.

Use M25 grade of concrete and Fe 500 grade of steel. Draw neat sketches showing details of main reinforcement & torsional reinforcement in two way slab. **[25]**

OR

Q4) Design the I and II flights of a dog legged staircase as shown in figure 1 using the following data: **[25]**

i) No of risers in I flight = 9, At plinth level plinth beam is provided below first tread of width 250mm.

ii) No of risers in II flight = 9.

iii) Floor to floor height = 3.15m.

iv) Live load = 4 kN/m^2.

v) Floor finish = 1kN/m^2.

Materials: M25 Grade of concrete, Fe 500 grade of reinforcement.

Show detailed load calculations. Draw the reinforcement details in sectional elevation for both flights.

SECTION - I

Q5) A continuous R.C.C. floor beam B1-B2 (Refer Fig.1) is simply supported at end supports and continuous through column C2. Consider live load on slab 3kN/m^2 and floor finish 1.5 kN/m^2. Assume slab thickness 130mm for load calculation. Consider 230 mm thick brick wall on all exterior beams. Floor to floor height is 3.15m. Show detailed load calculations and determine support moments, maximum span moments for all beams, using 20% redistribution of moments. Draw bending moment diagram and design the beam **only for flexure**. Show the reinforcement details along the length of beam with suitable cross sections. **[25]**

Material-Concrete of grade M20, Fe 500 reinforcement.

OR

Q6) Design a continuous beam ABCD for flexure and shear using IS Code method. AB=BC=CD=4.5m. The beam carries dead load of 20 kN/m (including its self-weight) and live load of 10 kN/m. Take material M30 and Fe500. Show the reinforcement detail in longitudinal section and cross-section at continuous support and at mid span. **[25]**

Q7) Design an axially loaded short column C11 as shown in Fig. 1 in ground floor for a G+2 building with following details: **[25]**

i) Floor to Floor height = 3.15 m.

ii) Height of column below plinth= 2.5 m.

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

iv) Floor Finish Load =1.0 kN/m^2.

v) Water Proofing Load on roof slab = 1.5 kN/m^2.

vi) Wall thickness = 150 mm (Internal).

vii) Slab thickness = 130 mm.

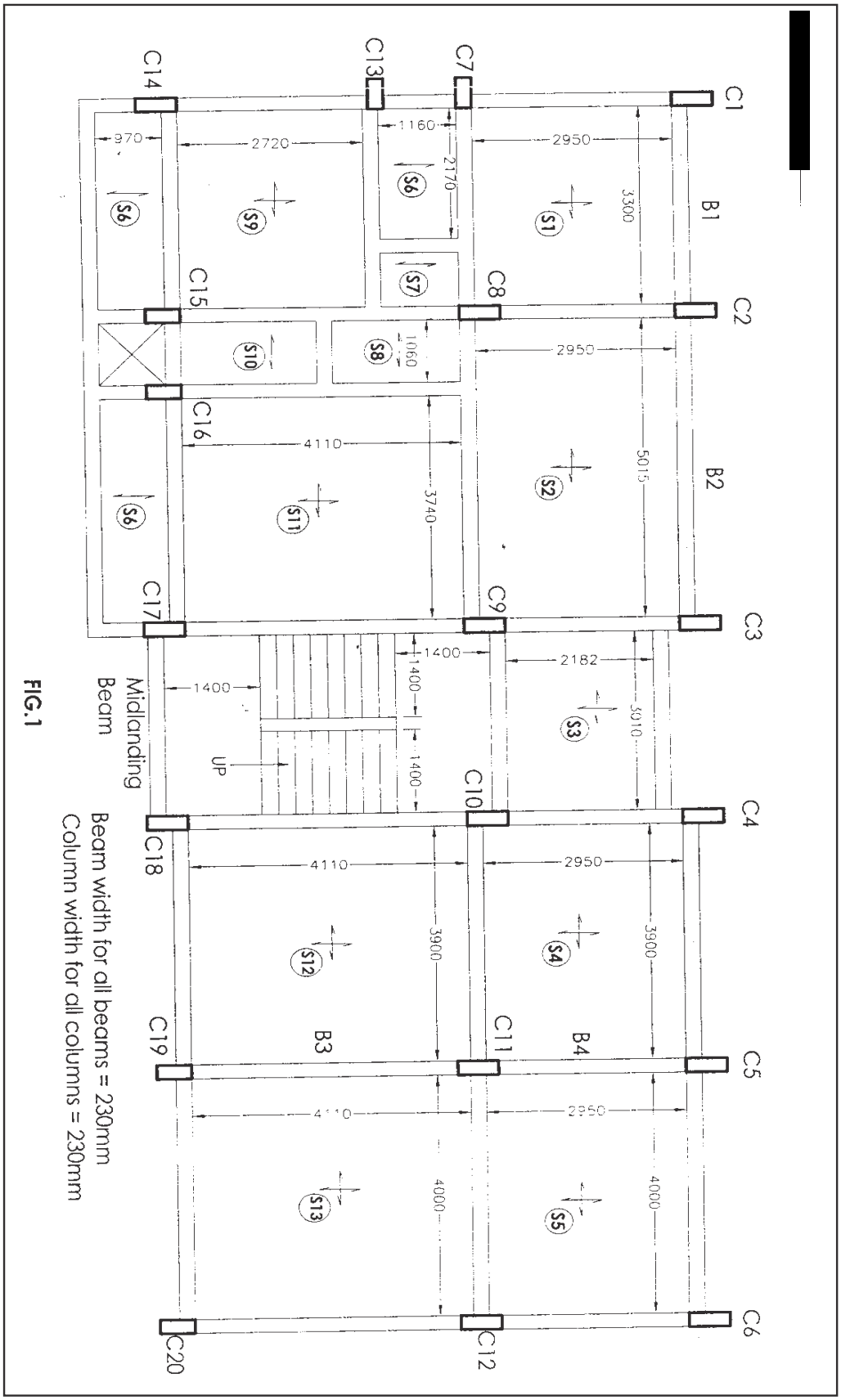
viii) Size of beams = 230x450 mm.

ix) Safe bearing capacity of soil = 200 kN/m^2. Also design isolated footing for column C11.

Material M 25 and Fe 415 used. Show detailed load and design calculations and reinforcement details in plan and sectional elevation.

OR

Q8) Design a bi-axial short column by limit state method with material M25 and Fe 415 to carry a working load of 800 kN, working moment of 100kN-m about major axis, bisecting the depth of column and 12 kN-m about minor axis, bisecting the width of column. The unsupported length of column is 3.6m. The column is fixed at one end and hinged at the other. Also design the footing for this column considering axial load and moment about major axis only. Take SBC = 300 kN/m^2. Show detailed design calculations and reinforcement details in plan and sectional elevation. **[25]**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S11
S12
S13
970
2720
1160
2170
2950
3300
1060
4110
3740
5015
1400
2182
3010
UP
3900
4000
Midlanding Beam
Beam width for all beams = 230mm
Column width for all columns = 230mm

FIG.1

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

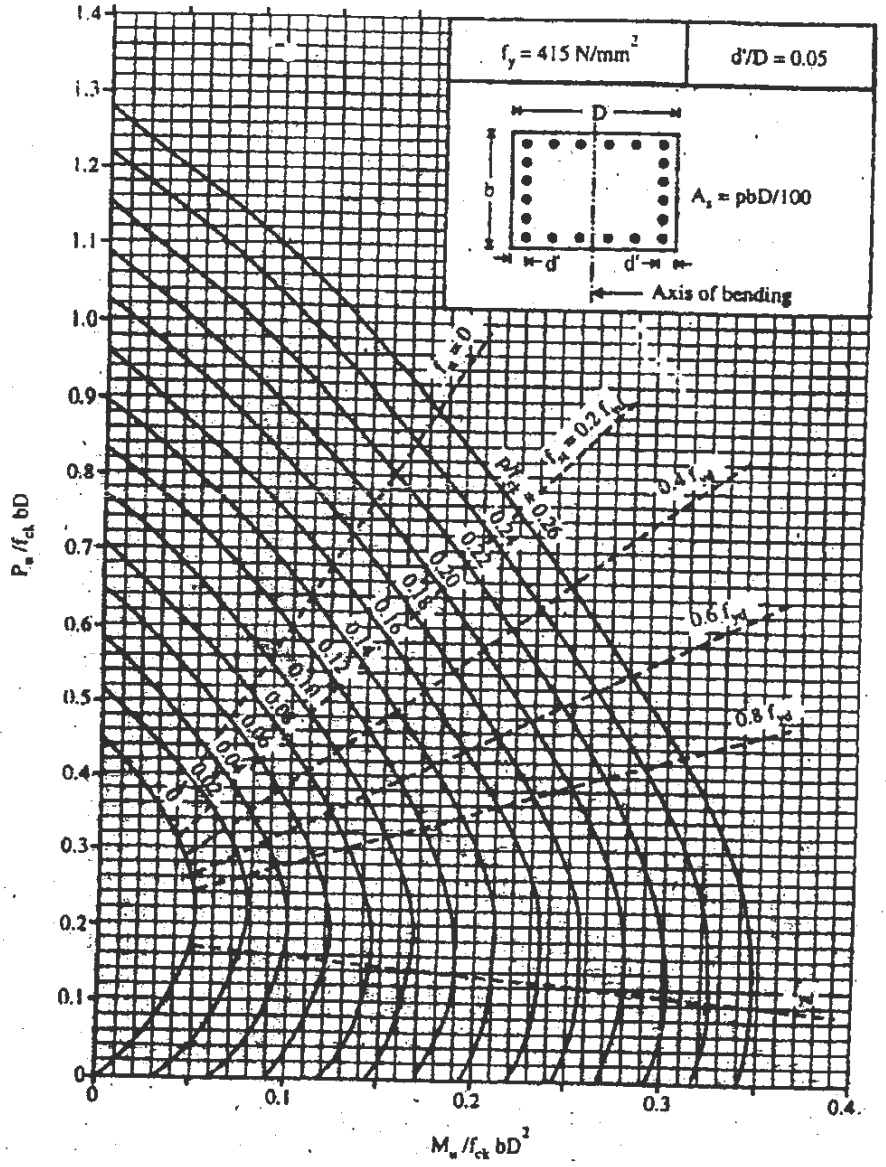

Chart - 5

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

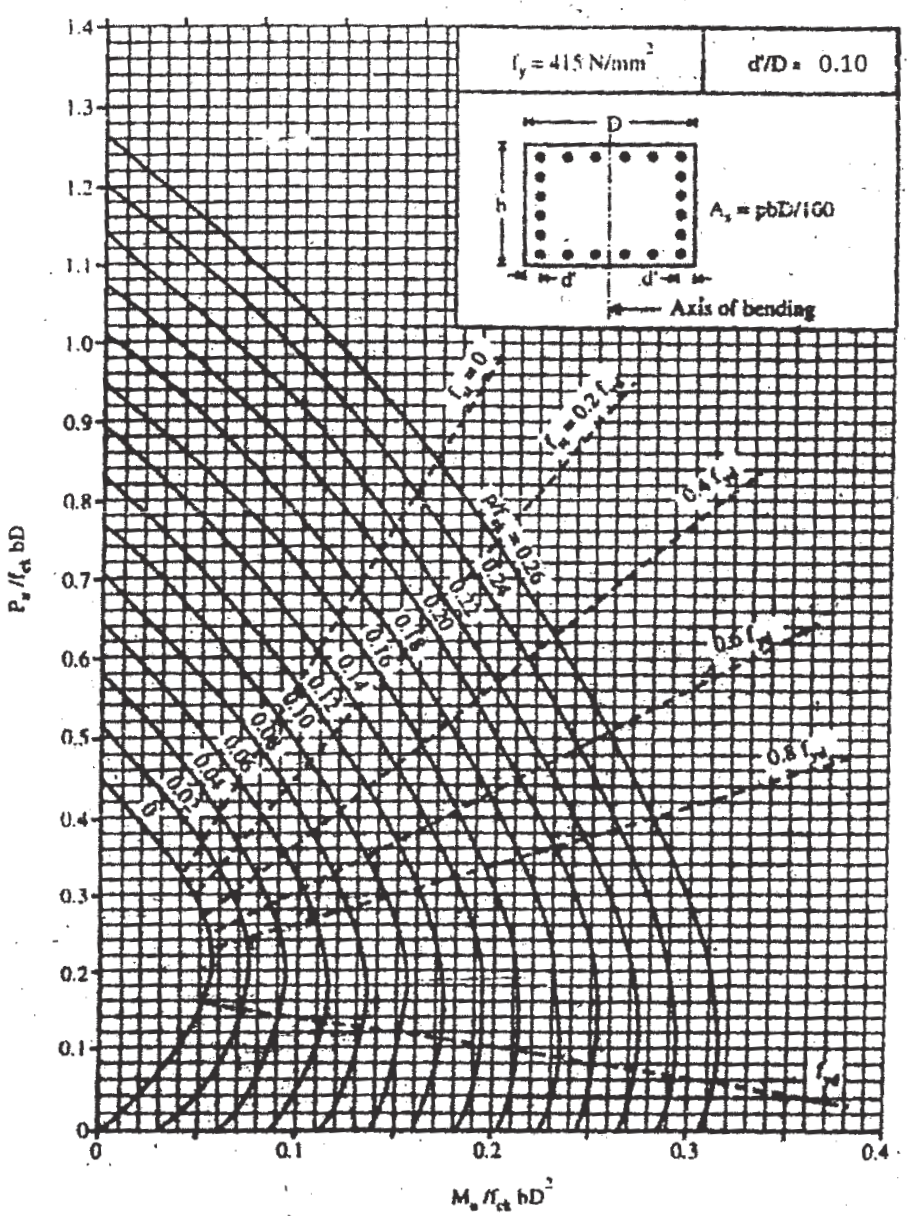

Chart 6

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