Total No. of Questions : 8]

SEAT No. :

P2252

[Total No. of Pages :7

[4758] - 9
T.E. (Civil Engineering)
STRUCTURAL DESIGN - II
(2008 Course) (Semester - II) (301008)

Time : 4Hours] *[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) ***Answers 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) Explain with sketches, why do continuous T-beam at support have to be designed as rectangular section? Draw the cross section of continuous T-beam at support and midspan. **[9]**

b) Explain the circumstances under which doubly reinforced section is provided. **[6]**

c) A tee beam of effective flange width 1500 mm, thickness of slab 120 mm, width of rib 300 mm and effective depth of 500 mm is reinforced with 4 nos. 25 mm diameter bars. Calculate the factored moment of resistance. The materials are M25 grade concrete and HYSD reinforcement of grade Fe 415. **[10]**

OR

Q2) a) Explain with neat sketch Balanced, Under reinforced and Over reinforced section as per WSM and LSM. **[8]**

b) Calculate the design constants for the following materials considering the balanced design for singly reinforced section. The materials are grade M 30 concrete and Fe 500 grade steel reinforcement. Use LSM. **[6]**

P.T.O.

c) Calculate moment of resistance and safe superimposed UDL that the beam can carry by WSM for following details: Effective simply supported span = 5 m, width of beam = 230 mm, overall depth of beam = 550 mm, 4 nos. 20 mm diameter on tension side and 2 nos. 16 mm diameter on compression side, Effective cover = 40 mm. Material M20, Fe 415. **[11]**

Q3) Design floor slabs S7 and S9 only for flexure and torsion. Refer the centerline structural plan given in Figure 1. Width of all beams is 230 mm. Consider live load = 4kN/m^2, Floor finish = 1.5 kN/m^2.

Use M25 grade of concrete and Fe 415 grade of steel. Draw neat sketches showing details of main reinforcement and torsional reinforcement in two way slab. **[25]**

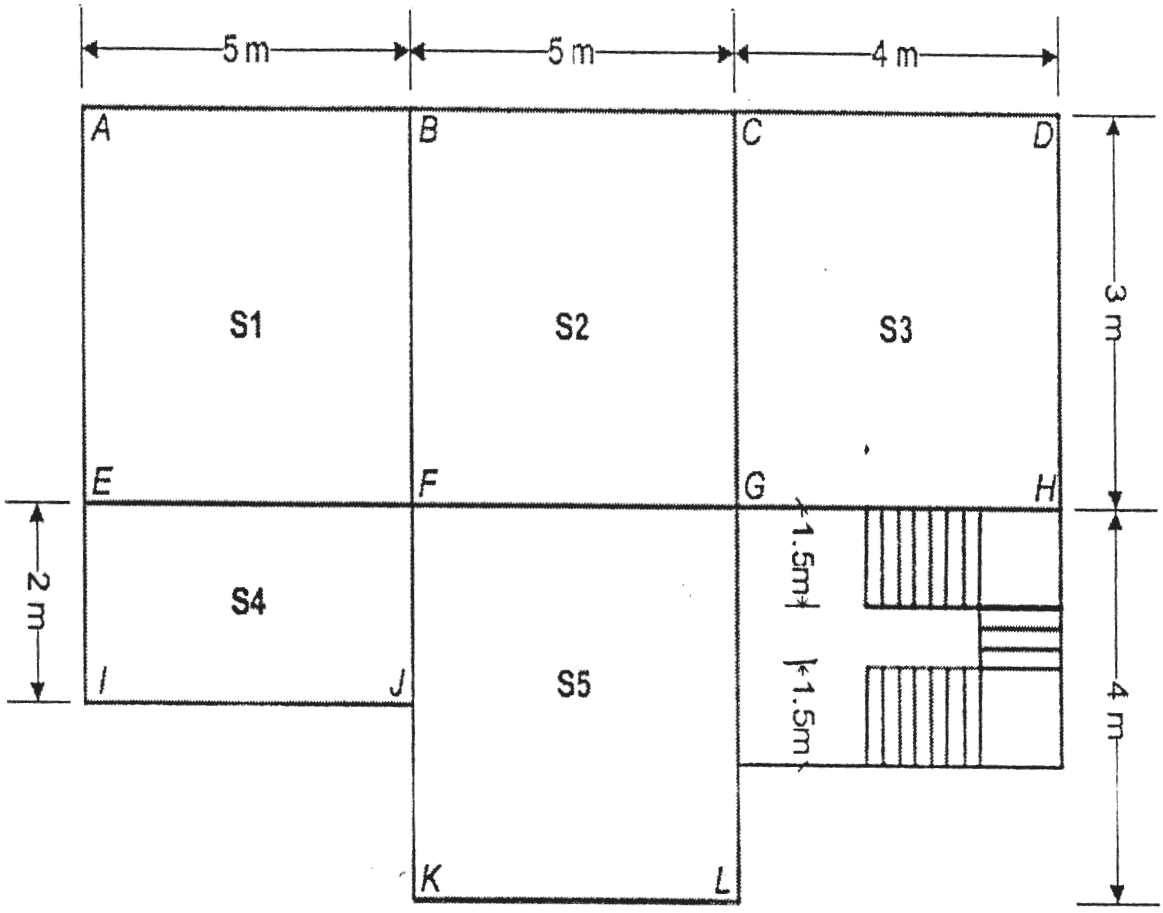

Figure 1

OR

Q4) Design a open well staircase for following data: **[25]**

Floor to floor height : 3.00 m

Riser = 150 mm, Tread = 300 mm, Width of stair = 1500 mm

No. of risers:

Flight I : 8 nos.

Flight II : 4 nos.

Flight III : 8 nos.

Material M25 & Fe500.

Refer the centerline structural plan given in Figure 1. Width of all beams is 230 mm. Draw the reinforcement details in sectional elevation for both flights.

SECTION - II

Q5) a) Design a continuous beam ABCD of span total span 12*m* for flexure and shear using IS Code method. AB = BC = CD = 4.0m. The beam carries dead load of 18 kN/m (including its self-weight) and live load of 12 kN/m. Take material M20 and Fe500. Show the reinforcement detail in longitudinal section and cross-section at continuous supports and at mid spans. **[20]**

b) Find out the shear capacity of beam section 300 mm wide × 600 mm deep (overall depth). Clear cover to the reinforcement is 25 mm. The support is reinforced with 3 bars of 25 mm diameter on tension side and 8 mm diameter - 2 legged vertical stirrups @150 mm C/C used as shear reinforcement. Materials M25 and Fe 500. **[5]**

OR

Q6) Continuous RC beam ABC of rectangular section is simply supported at A and C and continuous over support B. Span AB = 4.0m and BC = 5.0m. The beam carries dead load of 20 kN/m (including its self weight) and live load of 18 kN/m. Calculate design moments at central support B and near mid span of AB after 20% redistribution of moments. Show the bending moment envelop. Draw the reinforcement details at mid span and at continuous support. Design shear reinforcement only for span AB. **[25]**

Q7) a) Explain in detail interaction diagram used for design of column. **[5]**

b) Design an axially loaded rectangular short column with material M25 and Fe 415 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. Take SBC = 160 kN/m^2. Show detailed design calculations and reinforcement details in plan and sectional elevation. **[20]**

OR

Q8) Design a bi-axial short column by limit state method with material M25 and Fe 500 to carry a working load of 900 kN. Working moment of 80 kN-m about major axis bisecting the depth of column and 40 kN-m about minor axis bisecting the width of column. The unsupported length of column is 4.0 m. 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 = 250 kN/m^2. Show detailed design calculations and reinforcement details in plan and sectional elevation. **[25]**

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

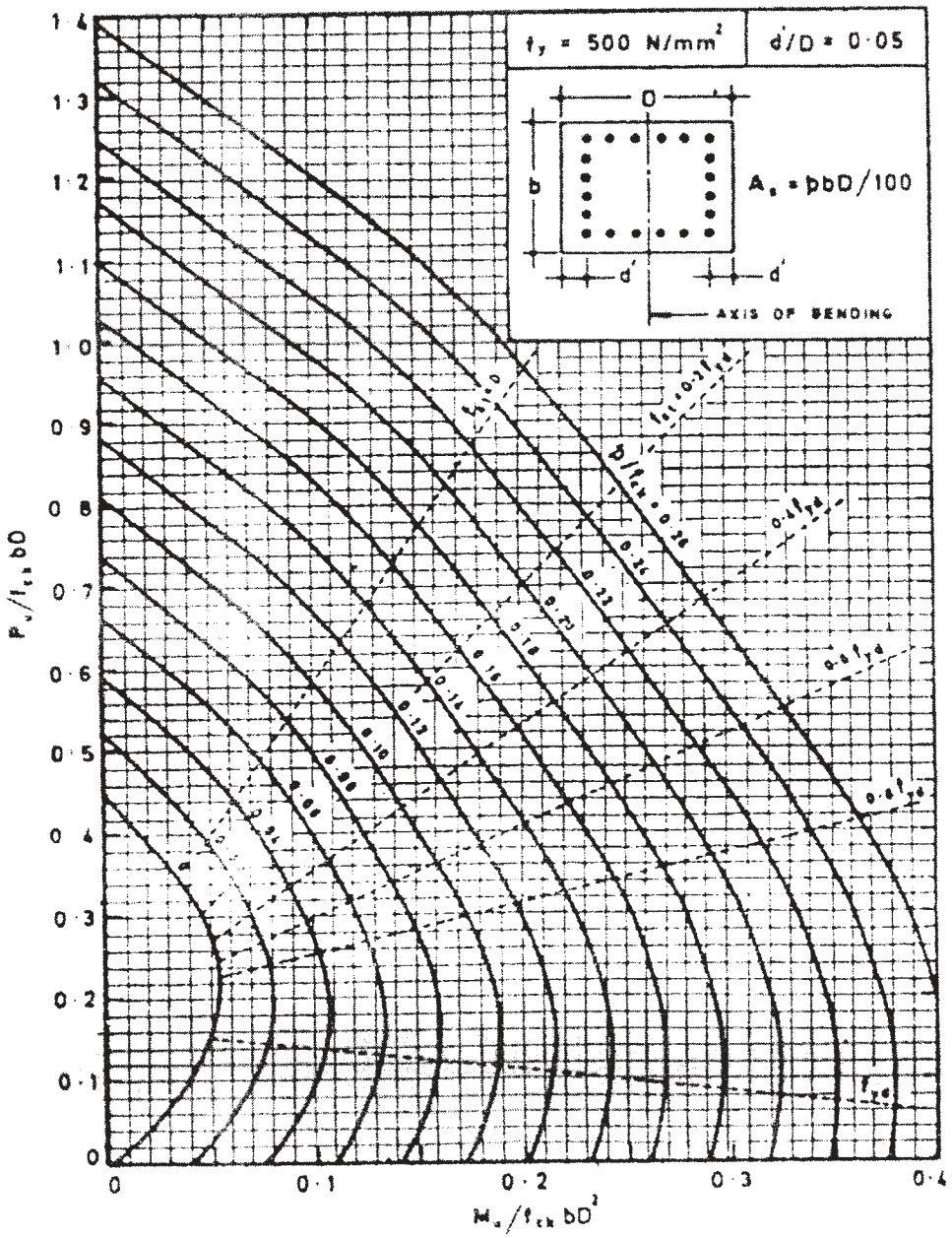

Chart - 14 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.

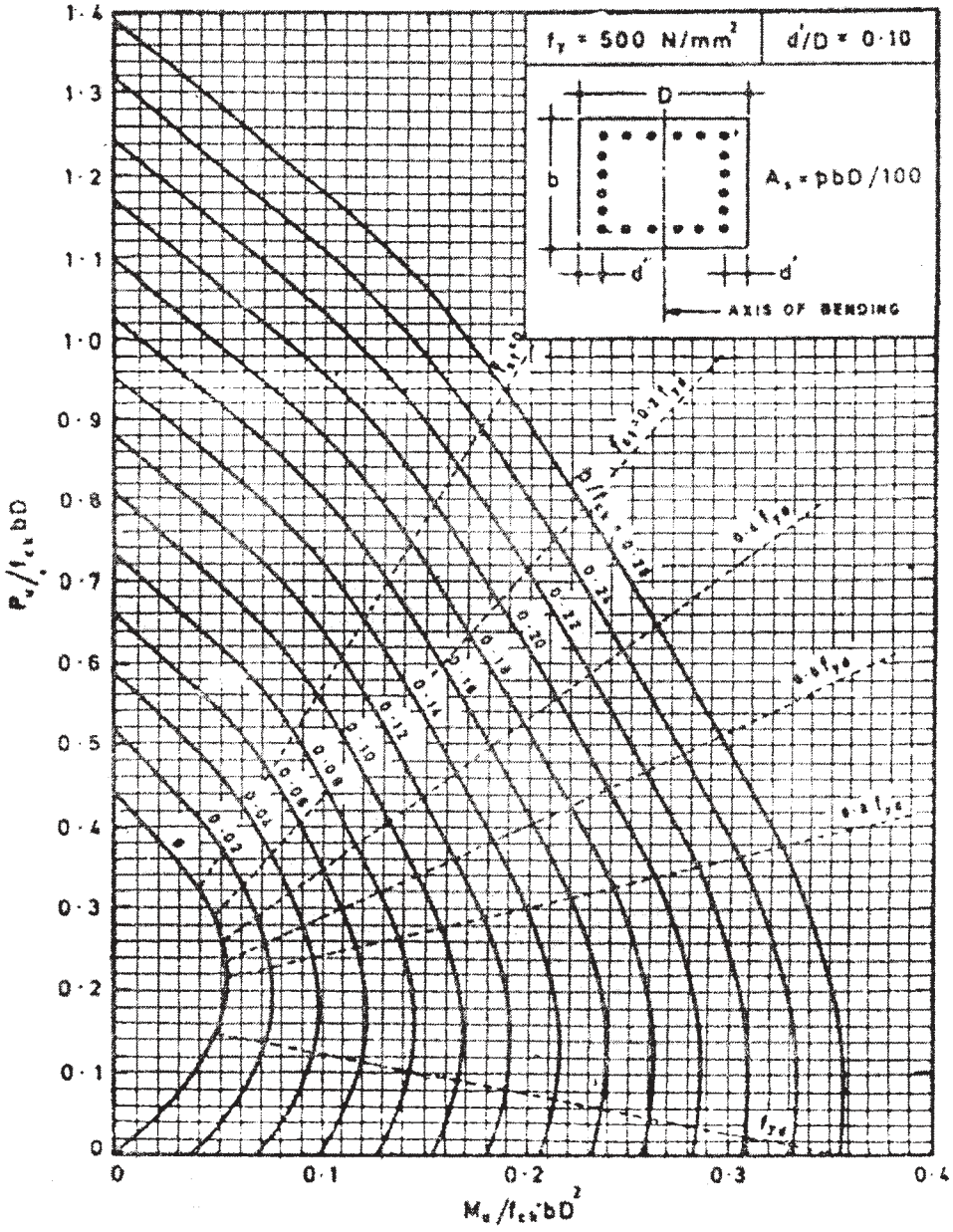

Chart - 15 Interaction Diagram for Combined Bending and Compression Rectangular Section - Equal Reinforcement on All Sides.