Total No. of Questions : 8]

SEAT No. :

P2385

[Total No. of Pages : 6

[5153]-8
T.E.(Civil)
STRUCTURAL DESIGN - II
(2008 Course) (Semester -II)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, and Q.3 or Q.4, in Seaction-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) i) Draw strain and stress distribution diagrams with all parameters for the design of RCC section of flexural member using LSM. **[4]**

ii) Explain the stress strain relationship for concrete according to the assumptions in limit state of collapse in flexure. **[4]**

b) A rectangular, singly reinforced beam, 300mm wide and 467mm effective depth is used as a simply supported beam over an effective span of 5. The reinforcement consists of 4 bars of 16mm diameter at tension face. Find the safe uniformly distributed load to its self weight. Use WSM with M25 concrete and Fe 415 steel. **[9]**

c) Calculate the moment of resistance by LSM for flanged beam section detailed as below **[8]**

i) Width of rib = 230mm

ii) Effective flange width = 1400mm

iii) Thickness of flange = 140mm

iv) Effective depth = 467mm

v) Tension steel = 4 Nos. – #16 through plus + 2 Nos. –#16 curtail at midspan.

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

OR

P.T.O.

Q2) a) A rectangular beam section, 230mm wide and 500mm deep is reinforced with 4 bars of 20mm diameter in the tensile zone and 2 bars of 16mm in the compression zone. The clear cover is 25mm for both the reinforcement.
Determine moment of resistance of the section using WSM. Use M20 grade of concrete and Fe 415 grade of steel. **[8]**

b) A simply supported reinforced concrete beam has the following data:
i) Clear Span of beam = 5.2 m
ii) Width of supporting columns=230mm
iii) Beam section = 230×510mm
iv) Ultimate UDL on beam = 50kN/m, lnclusive of self weight
v) Reinforcement at top – 2 Nos of 10mm diameter bars
vi) Reinforcement at bottom – 2 Nos of 16mm diameter bars through + 2nos of 16mm diameter bars curtail. **[17]**

Design the shear reinforcement using vertical stirrups. Draw neat diagram showing zoning.
Material-Concrete of grade M25, All reinforcement-Fe500

Q3) Design the floor slab of a seminar hall of inside dimensions 8.77m × 15.77m. The thickness of the wall is 230mm. The centre to centre distance between the beams is 4m. Consider live load=4kN/m^2, Floor finish = 1.5kN/m^2.
Use M25 grade of concrete and Fe 500 grade of steel. Draw neat sketches showing details of main reinforcement. **[25]**

OR

Q4) Design the I and II flights dog legged staircase from plinth level to the first floor level for the following data: **[25]**
i) No of risers in I flight = 8
ii) No of risers in II flight = 10
iii) Floor to floor height = 3150mm
iv) Rise = 175mm; Tread = 250mm
v) Width of stair = 1200mm
vi) Live load = 4kN/m^2,
vii) Floor finish = 1.0 k/m^2

At plinth level, plinth beam is provided below first step, whereas at midlanding level and first floor level beam is provided at the outer face of landing.
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-II

Q5) Continuous RC beam ABCD of rectangular section is simply supported at A and C and continuous over support B. Span AB = 4.0m, BC = 6.0m and CD = 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 120mm slab on both sides. Calculate design moments at support B and near mid span of BC after 20% redistribution of moments. Design the beam at these two locations only for flexure and draw the reinforcement details.

Material-Concrete of Grade M30, Fe 500 reinforcement.

[25]

OR

Q6) Design a continuous beam ABCD of span 9*m* for flexure and shear using IS Code method. AB=BC=CD=3.5m. The beam carries dead load of 16 kN/m (including its self-weight) and live load of 10 kN/m. Take material M30 and Fe 500. Show the reinforcement detail in longitudinal section and cross-section at continuous support and at mid span. **[25]**

Q7) a) Design an axially loaded rectangular short column to carry a working load of 900 kN. The unsupported length of column is 3.6 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 =200 kN/m^2.

Material M 25 and Fe 415 used. Show detailed load and design calculations and reinforcement details in plan and sectional elevation.**[20]**

b) State the functions of longitudinal and transverse reinforcement in columns. **[5]**

OR

Q8) Design a bi-axial short column by limit state method with material M25 and Fe 415 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 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 = 250 kN/m^2. Show detailed design calculations and reinforcement details in plan and sectional elevation. **[25]**

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

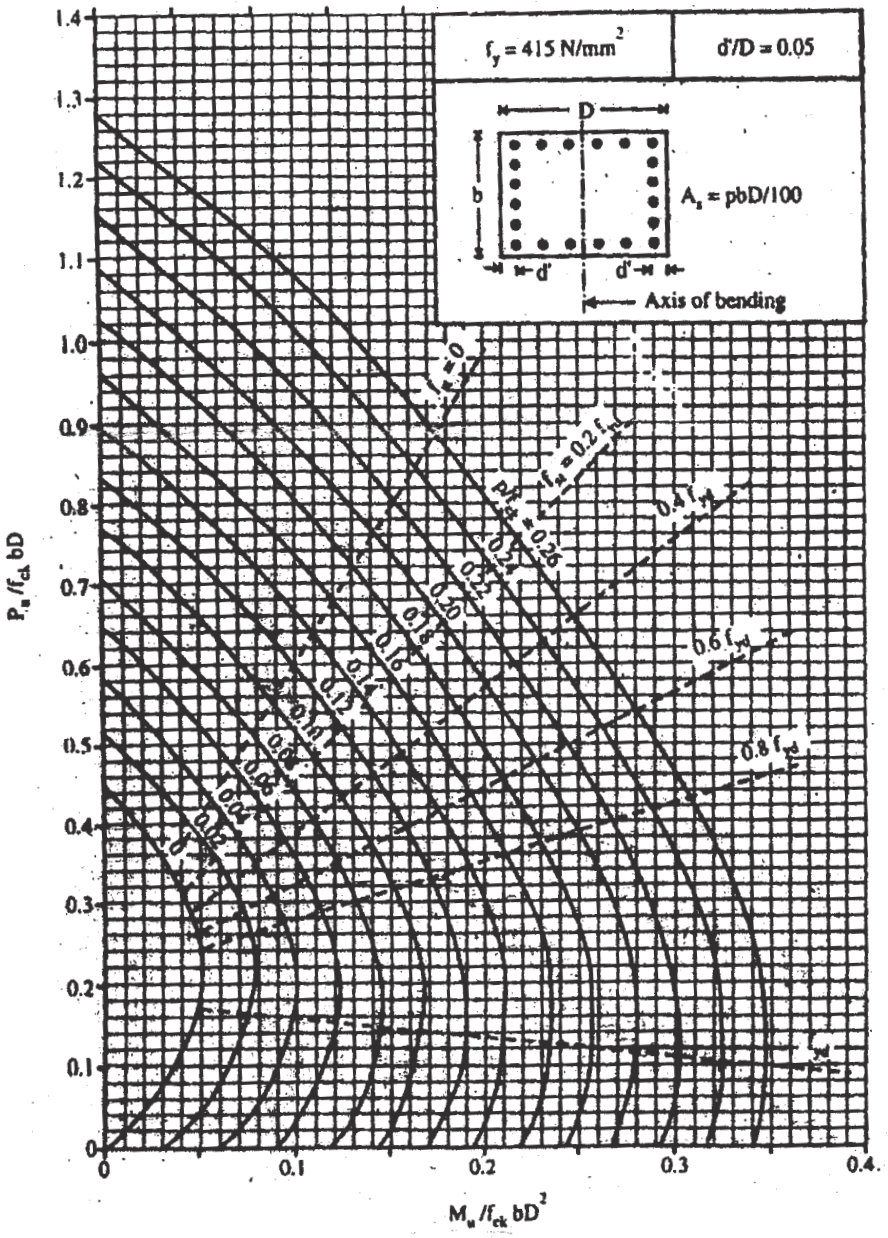

Chart 5