Total No. of Questions : 6]

SEAT No. :

P3974

[Total No. of Pages : 3

[4860] - 43

M.E. (Civil - Structures) (Semester - I)

PLASTIC METHOD FOR ANALYSIS AND DESIGN OF STEEL STRUCTURES

(Elective - II (c)) (2008 Pattern)

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

Instructions to the candidates:

1) ***Answer any two questions from each section.***
2) ***Answers to the TWO sections should be written in separate answer books.***
3) ***Neat sketches must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable calculator, IS : 800 - 2007 and steel table is allowed.***
6) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Explain complete, over complete and partial collapse of structure. **[5]**

b) Determine shape function of I-section having following dimensions. **[12]**

Top flange = 250 x 50 mm

Bottom flange = 350 x 50 mm

Web = 40 x 400 mm (overall depth)

c) A simply supported beam of span '*l*' is subjected to central load 'W'. In progressive loading when W reaches to W_p - plastic collapse occurs. Draw a neat sketch showing zone of plasticity in the beam. State the equation for depth of yielding 'e' at any section in zone of plasticity. **[8]**

Q2) a) A Rectangular Portal frame PQRS is fixed at P & S. Columns PQ & RS are 5m in height & beam QR is 6m long. Mp for beam is thrice that for columns. It is subjected to factored udl of 40 kN/m over QR & horizontal factored concentrated load of 80 kN at Q in the direction QR. Sketch all possible mechanisms & obtain design moment Mp. Also draw statically admissible bending moment diagram. **[13]**

P.T.O.

b) A continuous beam ABCD is simply supported at A, B, C & D. Spans AB = 4m, BC = 6m & CD = 4m. Mp is uniform. It is subjected to factored loads as under. **[12]**

i) Total udl value on AB & CD = W.

ii) Concentrated load 2W at center of BC.

Find collapse load 'W' & draw statically admissible bending moment diagram. What is the type of collapse?

Q3) A symmetrical gable portal frame ABCDE has bases A & E fixed 12 m apart. Vertical columns AB & ED each equal to 4 m & apex C is 8 m above base. It is subjected to horizontal load 25 kN at B & concentrated load of 60 kN each at centre of each gable beam. Mp is uniform. **[25]**

a) Draw all basic mechanisms and obtain Mp in each case.

b) Draw (sway + Gable) mechanism & obtain Mp.

c) Draw free body diagram of beam & column.

SECTION - II

Q4) a) Classify symmetrical 'I' section having width of flange 300 mm & overall depth 400 mm. Thickness of section is 30 mm uniform. F_y = 280 MPa. If this section is used as a beam, find moment of resistance as per IS : 800-2007 codal provisions. **[12]**

b) A simply supported beam has a span 5 m. If section used is ISLB 350. Find moment of resistance of the section in following two cases.

i) Compression flange is laterally supported fully.

ii) Compression flange is laterally restrained at both the ends and at Mid span only. Use F_y = 250 MPa. **[13]**

Q5) A column in a building is subjected to factored axial compressive load of 300 kN & factored bending moments of 55 kN.m & 40 kN.m at its top hinged end & bottom fixed end respectively. Both bending moments produce identical curvature about zz axis. Height of column is 4.5m & it is braced at its mid height to provide local lateral restraint for buckling about yy axis . The column belongs to non-sway frame. Design the section & use specifications for interaction between moment & axial compression as per IS : 800 - 2007. **[25]**

Q6) In a rectangular portal frame, a corner connection is to be designed. Bending moment at knee is 180 kN.m. If designed section for beam & column both is ISMB 400. Design & Draw details at knee portion F_y = 250 MPa. Apply all checks & provide diagonal stiffener if required any. **[25]**