



**P.E.S. College of Engineering, Mandya - 571 401**

*(An Autonomous Institution affiliated to VTU, Belgaum)*

**Second Semester, M. Tech - Civil Engineering (MCAD)**

**Semester End Examination; June - 2016**

**Advanced Design of Steel Structures**

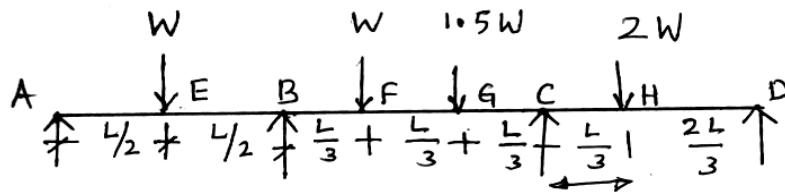
Time: 3 hrs

Max. Marks: 100

- Note:** i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.  
 ii) Assume missing data if any.  
 iii) Use of IS 800, IS 801, IS 811 and steel table are permitted.

**UNIT - I**

- 1 a. Explain moment curvature relation with the help of a neat sketch as applied to plastic analysis. 5  
 b. Determine the collapse load for the continuous beam shown in Figure -1,



CONSTANT  $M_p$

Figure -1

- 2 a. Explain the effect of axial load on the plastic moment capacity of section with the help of neat sketch. 5  
 b. Determine the plastic moment for the portal frame shown in Figure -2,

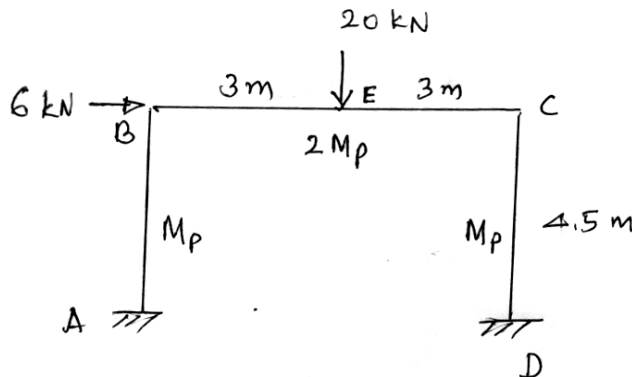


Figure -2.

**UNIT - II**

- 3 a. What are the various factors which affect the lateral buckling of beams? Explain. 6  
 b. A simply supported beam of clear span 6 m supported on 250 mm wall is subjected to an all inclusive load of 25 kN/m. The beam is laterally unsupported. Design the beam using suitable ISBM as per IS: 800. Also find its critical moment ( $M_{Cr}$ ). 14

- 4 a. Explain the behavior of laterally unsupported beam with the help of neat sketches. 10
- b. Explain the phenomenon of Web buckling, Web crippling and Diagonal buckling in case of beam with the help of neat sketches. 10

**UNIT - III**

- 5 a. Explain the behavior of beam-column with the help of neat sketches. 8
- b. A beam column of span 6 m, laterally supported carries 40 kN-m and 20 kN-m moment about major and minor axes respectively. The axial force at the center of beam-column is 100 kN. Determine the adequacy of the ISMC 400 for this beam-column as per IS-800 provisions. Take;  $f_y = 350$  MPa. Perform section check only. 12
- 6. Design a beam-column subjected to an axial force of 400 kN and uniform bending moment of 200 kN-m about the major axis. The effective length of column is 4 m. Take;  $f_y = 400$  MPa. Apply both section and member checks. 20

**UNIT - IV**

- 7. Design a castellated beam for a span of 8 m subjected to a design load of 20 kN/m. Check for bending and shear stresses. Also find its deflection. 20
- 8 a. Explain the bending stress analysis of castellated beam. 6
- b. Explain the primary and secondary bending deflection in case of castellated beam. 6
- c. Write a note on open web beams made of angles and rods for industrial application. 8

**UNIT - V**

- 9 a. Explain local buckling and post buckling of cold formed light gauge sections. 8
- b. Explain the following as applied to light gauge sections : 12
  - i) Stiffened and un-stiffened elements
  - ii) Form factor
  - iii) Flange curling.
- 10 a. What are the advantages and disadvantages of structural steel tubes? 6
- b. Determine the load carrying capacity of the light gauge section shown in Figure -3 when used as a column of effective length 5m. Use  $f_y$  250 steel.

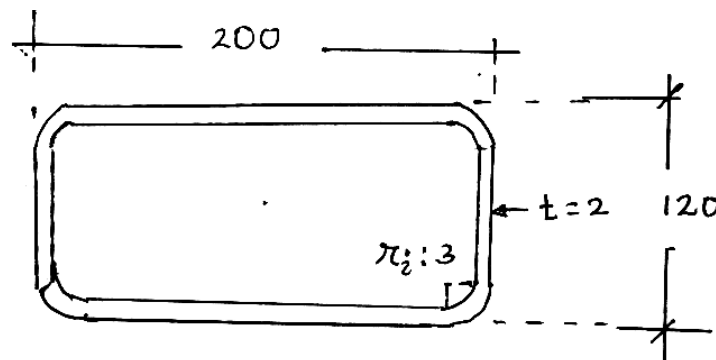


Figure - 3

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