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

(An Autonomous Institution affiliated to VTU, Belagavi)

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

Semester End Examination; May / June - 2019

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) IS:800 and IS:801 are permitted. iii) Assume missing data suitably. iv) Steel table is permitted.

UNIT - I

1 a. Explain lateral buckling of beam with the help of a neat sketch. Mention the factors which affect the same. 5

b. A simply supported beam of span 6.2 m consists of ISMB400@615 N/m. The beam is subjected to end moments of 200 kN-m clockwise and 100 kN-m anticlockwise. Find the critical moment (M_{cr}) for lateral torsional bending as per IS provisions. 15

2. Design a laterally unrestrained beam simply supported over an effective span of 6 m subjected to an udl of 45 kN/m. Take f_y 250 steel. Check for web buckling and web crippling as well. 20

UNIT - II

3. A beam column of effective length 4 m carries 20 kN-m and 80 kN-m moments about minor and major axes respectively. The axial load on the beam column is 1000 kN. If ISMB450@855 N/m is used, determine its adequacy as per IS:800. Take f_y 250 steel. Apply both section and member checks. 20

4. A non sway column of a frame with flexible joints is 4 m height and subjected to following loads :

Fractured axial load = 500 kN

Fractured moment M_z at top of column = 25 kN-m 20

Fractured moment M_z at bottom of column = 45 kN-m

Design a suitable beam column assuming f_y = 250 N/mm^2

The effective length of column is 0.8 L along both axes

UNIT - III

5 a. Mention the advantages and disadvantages of castellated beams. 6

b. Explain the bending analysis of castellated beam with the help of neat sketches. 7

c. With neat sketches, explain the failure pattern of beam with web openings. 7

6. Design a castellated beam for a span of 14 m subjected to an imposed load of 10 kN/m. Assume that the compression flange is fully restrained. Check the stresses for the second hole only. Use f_y 250 steel. 20

Contd…2

UNIT - IV

7 a. Explain the behavior of stiffened light gauge steel element with the help of neat sketch. 5

b. Determine the load carrying capacity of the light gauge section shown in Fig. (Q. 7b), if it is used as column of effective height 4 m. Take f_y = 240 MPa. 15

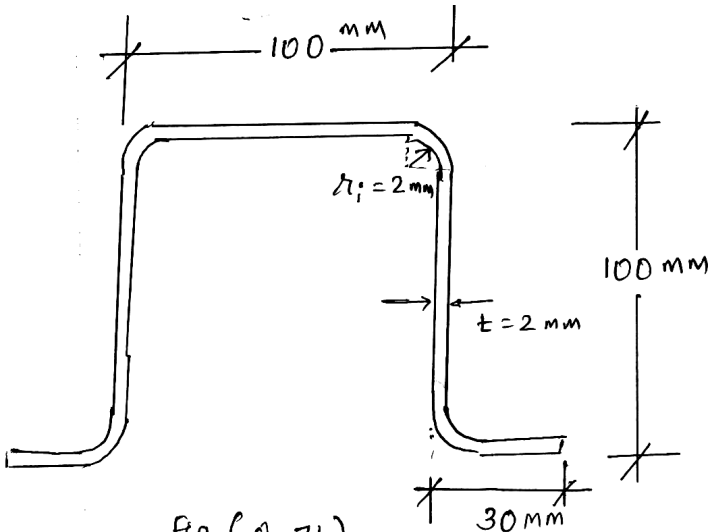

Fig. (Q. 7b)

8 a. What is flange curling in case of cold formed light sections? How is it controlled in the design? 5

b. Design a light gauge steel column to carry a load of 140 kN over an effective length of 2.5 m. Use f_y = 240 MPa steel. 15

UNIT - V

9 a. Explain the calculation of period of structural adequacy as per IS: 800-2007. 10

b. Explain the various methods of steel protection against fire with the help of neat sketches. 10

10 a. Explain the properties of structural steel subjected to temperature. 10

b. Write a note on fire resistance level and period of structural adequacy as applied to structural steel subjected to fire. 10

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