



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 - 2018

Advanced Design of Steel Structure

Time: 3 hrs

Max. Marks: 100

Note: i) Answer **FOUR** full questions, selecting **ONE** full question from each unit.

ii) IS: 800-2007 and IS: 801:1975 is permitted. iii) Assume missing data suitably, if any.

UNIT - I

- 1 a. Discuss the factor affecting lateral stability of beams. 10
- b. Check the adequacy of ISMD450 to carry an udl of 24 kN/m over a span of 6 m. Both ends of the beam are attached to the flanges of columns by double web cleat. 15
- 2 a. Explain the similarity of column building and lateral buckling of columns. 5
- b. Design a laterally unrestrained fixed beam of 6 m span subjected to an udl of 20 kN/m as per IS provisions. Take $f_y = 250$ MPa. 20

UNIT - II

- 3 a. Explain P- Δ and P- \square effects as applied to long beam columns. 5
- b. A non-sway intermediated column in a building frame with flexible joints is 4 m high and it is ISHB 300 @ 588 N/m steel section. Check the adequacy of the section when the column is subjected to following load :
- Factored axial load = 500 kN
- Factored moments :
- | | M_z | M_y |
|--------|-----------|------------|
| Bottom | +7.0 kN-m | -1.0 kN-m |
| Top | +15 kN-m | +0.75 kN-m |
- Assume effect length of the column as 3.4 m long both the axes. Take $f_y = 250$ MPa and $E = 2 \times 10^5$ MPa. 20
- 4 a. Explain the effect of slenderness ratio and axial force and modes to failure of beam-columns. 5
- b. A beam-column of effective length 3.8 m carries 22 kN-m and 81.25 kN-m moment about minor and major axes respectively. The axial force at the centre of the beam-column is 1035 kN. Determine the adequacy of the ISHB450 @855 N/m for this beam-column as per IS:800 provisions. Take $f_y = 250$ MPa. Apply both section and member checks. 20

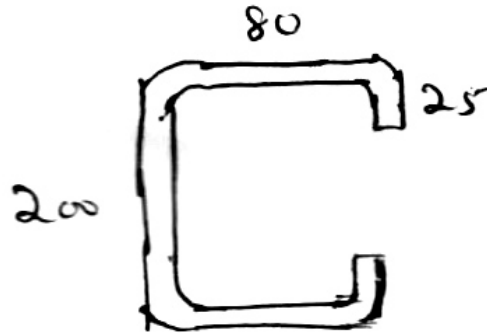
UNIT - III

- 5 a. Draw neat sketches of common types of web openings and stiffened and unstiffened opening. 10
- b. Describe the guide lines for web holes and various stiffening arrangements. 15

- 6 a. With a neat sketch, explain analysis of beams with perforated thick webs. 10
- b. Explain failure mechanism in plate girder webs with circular openings. 15

UNIT - IV

- 7 a. What are the advantages of cold rolled sections over hot rolled sections? 8
- b. Find out the allowable compressive force on the light gauge section 200 x 80 x 25 x 4 mm below.
Take $f_y = 240$ MPa and internal radius of corners = 1.5t



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- 8 a. With neat sketches, discuss the types of stiffened and unstiffened elements. 7
- b. Design a column of effective length 2.7 m using lipped channel for an axial load of 550 kN,
Take $E = 2 \times 10^5$ MPa, $f_y = 240$ MPa. 18

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