

Thapar Institute of Engineering & Technology, Patiala
1st Semester 2006-07

124

END SEMESTER EXAMINATION

Course No. CE 040 – Steel Structural Design

MM: 45

Notes: Attempt any FIVE questions. FIRST question is compulsory. All parts of a question MUST be attempted at one place. FIRST question carries 18 marks, and all other questions are of equal weightage. Indian Standard Codes are allowed.

- Q 1. (a) What is economical depth of a plate girder? Derive the necessary formula for the same.
- (b) Explain the difference between web buckling and web crippling.
- (c) Explain the design procedure for a slab base of a rectangular column.
- (d) What are various modes of failure of a riveted joint? Explain any three with the help of neat sketches.
- (e) In tension member, subjected to both axial tension and bending, prove the following expression.

$$\sigma_{at,cal} + 0.9 \sigma_{bt,cal} = 0.6 f_y$$
 Symbols have usual meanings.

(f) Explain the difference in the design procedure of laterally supported and laterally unsupported beams.

Q2. A bracket is subjected to a load of 100 KN as shown in Fig. 1. Determine the size of the weld so that the given load can be carried safely. Take the value of the stress in the weld as 110 MPa.

Q3. A column, 4.5 meter in length, effectively restrained in position as well as directions at both the ends, carries an axial load of 1200 KN. Design a suitable I-section, if the column is to be encased in concrete. Take f_y value as 250 MPa, and assumes any other data with proper logic, if not given here.

Q4. Design a rolled steel I-section for a simply supported beam with an effective span of 6.30 meters. It carries a maximum bending moment of 255 KN-m, and maximum shear force of 161 KN. The beam is laterally unsupported. Take value of f_y as 250 MPa.

Q5. (a) A tie of a roof truss of double angles ISA 100 x 75 x 10 mm with its short legs back to back and long legs connected to the same side of a gusset plate, with 16 mm diameter rivets. Determine the tensile load it can carry. Take f_y as 260 MPa.

(b) A single angle discontinuous strut ISA 70 x 70 x 8 mm of a roof truss is 1.2 meter long, and is connected by two rivets at each end. Determine the safe compressive load it can carry.

Q6. Determine the maximum load 'P', which the bracket can carry (Fig.2). Diameter of the rivets is 22 mm. Use power driven rivets.

