

Total No. of printed pages = 4

CE 181603

Roll No. of candidate

318/22

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2022

ICIMT & SUT  
Azara, Manjhiwajpara,  
Guwahati - 781017

B.Tech. 6<sup>th</sup> Semester End-Term Examination

STRUCTURAL DESIGN — II

(New Regulation & New Syllabus)

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks  
for the questions.

Use of IS:800-2007 allowed : Assume any missing data

Answer question No. 1 and any *four* from the rest.

1. Answer the following (MCQ/ Fill in the blanks) : (10 × 1 = 10)
- (i) The Modulus of elasticity of steel E is
- (a)  $2.0 \times 10^4 \text{ N/mm}^2$
  - (b)  $2.0 \times 10^5 \text{ N/mm}^2$
  - (c)  $2.2 \times 10^5 \text{ N/mm}^2$
  - (d)  $2.5 \times 10^5 \text{ N/mm}^2$
- (ii) If the angle between the fusion faces between  $60^\circ$  and  $90^\circ$ , then ratio of throat thickness to effective throat thickness would be
- (a) 0.70
  - (b) 1.45
  - (c) 0.65
  - (d) 1.25
- (iii) Permissible bending stress in compression for laterally supported beams for Plastic and Compact Section shall not exceed
- (a)  $0.60f_y$
  - (b)  $0.66f_y$
  - (c)  $0.75f_y$
  - (d)  $0.45f_y$

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- (iv) Cross-sections, which can develop plastic moment of resistance, but have inadequate plastic hinge rotation capacity for formation of plastic mechanism, due to local buckling are
- (a) Class 1 - Plastic Section
  - (b) Class 2 - Compact Section
  - (c) Class 3 - Semi Compact Section
  - (d) Class 2 - Compact Section
- (v) The Maximum Slenderness Ratio of a member carrying compressive loads resulting from dead loads and imposed loads
- (a) 250
  - (b) 350
  - (c) 180
  - (d) None of the above
- (vi) The effective length of prismatic compression members whose unsupported length is  $L$  and both the ends are restrained against rotation and translation is given by
- (a)  $0.60L$
  - (b)  $0.55L$
  - (c)  $0.90L$
  - (d)  $0.65L$
- (vii) The distance between centre of fasteners shall not be less than
- (a) 3.0 times the nominal diameter of the fastener
  - (b) 2.5 times the nominal diameter of the fastener
  - (c) 5.0 times the nominal diameter of the fastener
  - (d) 1.5 times the nominal diameter of the fastener
- (viii) In the case of welded lap joints, the minimum lap should not be less than
- (a) three times the thickness of the thinner part joined or 40 mm, whichever is more
  - (b) four times the thickness of the thinner part joined or 50 mm, whichever is more
  - (c) four times the thickness of the thinner part joined or 40 mm, whichever is more
  - (d) two times the thickness of the thinner part joined or 25 mm, whichever is more

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- (ix) In practice the actual length of weld is made of the
- effective length shown in drawing plus 1.5 times the weld size, but not less than THREE times the size of the weld
  - effective length shown in drawing plus 2 times the weld size, but not less than THREE times the size of the weld
  - effective length shown in drawing plus 2.5 times the weld size, but not less than FOUR times the size of the weld
  - effective length shown in drawing plus 2 times the weld size, but not less than FOUR times the size of the weld
- (x) The minimum edge and end distances from the centre of any hole to the nearest edge of a plate shall not be less than
- 1.5 times the hole diameter in case of rolled, machine-flame cut, sawn and planed edges.
  - 1.7 times the hole diameter in case of rolled, machine-flame cut, sawn and planed edges
  - 2.0 times the hole diameter in case of rolled, machine flame cut, sawn and planed edges
  - None of the above

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2. (a) Plastic Section Modulus is different from Elastic Section modulus. Briefly explain. (5)
- (b) Two plates of thickness 16 mm and 12 mm are in a lap joint and are to be designed to transfer a tensile load of 750 kN. If the 16 mm plate is 300 mm wide and the 12 mm plate is 250 mm wide, with the 12 mm plate resting on 16 mm plate, Design the joint with welding of appropriate size and length.  $f_y = 250 \text{ Mpa}$ ,  $f_u = 410 \text{ Mpa}$ . (10)
3. (a) Shape Factor defines the plastic moment capacity of a section. Briefly Explain. (5)
- (b) ISA 100 × 100 × 10 is used as a Tie member in a Truss. The section is connected to a gusset plate of thickness 12 mm by means of four bolts, which are arranged in single line with edge distance of 40 mm and pitch @ 50 mm c/c. The bolt dia. is 16 mm. Calculate the capacity of the member. (10)
4. (a) Welding has both advantages and disadvantages over bolting. Explain briefly. (5)
- (b) Calculate the maximum value of udl  $w$  that can be safely applied on the entire span on beam of span 4.45 meter. The beam is simply supported at both the ends and laterally restrained along the entire span. The section is ISMB 450 and the load is applied at the top flange.  $f_y = 250 \text{ Mpa}$ ,  $f_u = 410 \text{ Mpa}$ . (10)

5. (a) What is a Fillet joint? Briefly explain with illustration from IS code. (5)
- (b) A double angle discontinuous strut consists of two ISA 90 × 90 × 10 connected to either side of a 12 mm thick gusset plate with three 12 mm dia. bolts. The unsupported length of the strut is 2.65 meter. Calculate the load carrying of the section. (10)
6. (a) What do you understand by class of section based on rotation capacity without local buckling as given in IS code? Briefly Explain. (5)
- (b) A beam of span 4.5 meter is simply supported at both the ends and laterally un-restrained except at the end. The super imposed load on the beam is 20 kN/m. The load is applied at the top flange. Design the beam considering  $f_y = 250 \text{ Mpa}$ ,  $f_u = 410 \text{ Mpa}$ . (10)
7. (a) Buckling class decides the axial load carrying capacity of compression members %. Briefly explain. (5)
- (b) Design a column to carry an axial super imposed load of 1100 kN. The unsupported length of the column is 4.0 meter. The column is restrained against translation and rotation at both the end @ both the axes  $f_y = 250 \text{ Mpa}$ . (10)

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