Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(CE)/SEM-5/CE-505/2011-12

2011

STRUCTURAL DESIGN-II

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) The minimum pitch allowed in the code IS:800-2007 is

      a) 2·5 × diameter of bolt

      b) 1·5 × 5 diameter of bolt

      c) 3 × 5 × diameter of bolt

      d) 1·0 × 5 diameter of bolt.

   ii) The maximum edge distance in a member with rolled edge is approximately

      a) 1·5 × hole diameter

      b) 2 × bolt diameter

      c) 1·7 × hole diameter

      d) 1·7 × bolt diameter.

iii) Minimum length of the fillet weld should be

a) 4 times the size of weld

b) 3 times the size of weld

c) 2 times the size of weld

d) 1·5 times the size of weld.

iv) The maximum slenderness ratio permissible in steel ties is

a) 250 b) 350

c) 450 d) 400.

v) For rolled I-section, the curve which is used for major buckling is

a) Curve *A* b) Curve *B*

c) Curve *C* d) Curve *D*.

vi) As per IS:800-2007, the effective length of cantilever column is

a) 1·2 L b) 0·65 L

c) 2 L d) 3 L.

vii) The size of a fillet weld is indicated by

a) side of the triangle of the fillet

b) throat of the fillet

c) length of the fillet

d) size of the plate.

viii) The method of welding generally used in the structural steel is

a) gas welding b) thermit welding

c) electric arc welding d) none of these.

ix) The buckling load on a steel column is

a) directly proportional to the slenderness ratio

b) inversely proportional to the slenderness ratio

c) linearly related to the length

d) non-linearly related to the slenderness ratio.

x) The allowable direct tensile stress in mild steel rolled sections is about (in MPa)

a) 120 b) 150

c) 180 d) 200.

xi) Which of the following is not a serviceability criteria ?

a) Deflection b) Fatigue

c) Vibration d) Force resistance.

xii) For a Tie in a roof truss, subjected to possible reversal of stress, the slenderness ratio is limited to

a) 180 b) 250

c) 300 d) 350.

xiii) Which of the following section will be preferred for a column ?

a) ISLB b) ISMB

c) ISWB d) ISHB.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following $3 \times 5 = 15$

2. Describe the following terms (any *five*) :

a) Nominal Diameter b) Effective Length

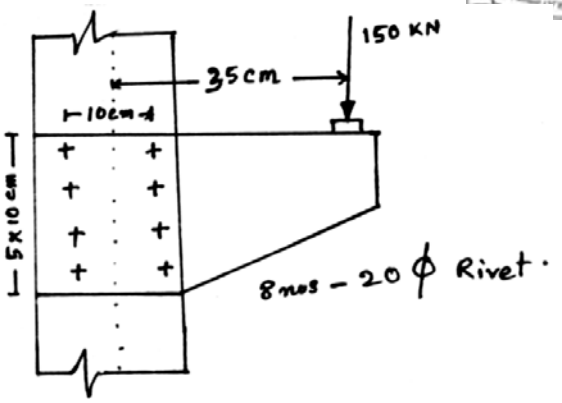
c) Pitch of Rivet d) Slenderness Ratio

e) Proof Load f) Gauge Distance

g) Radius of Gyration.

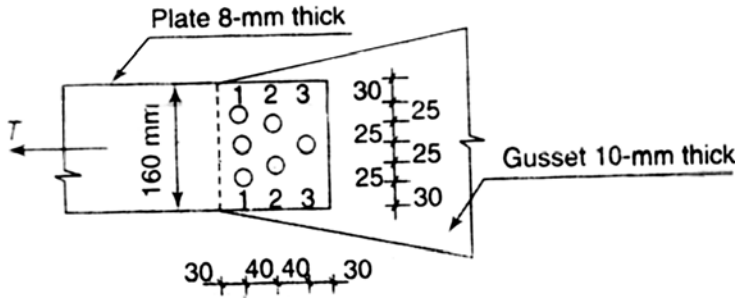
3. Discuss the various loads on roof trusses for design.

4.



Determine the safety of the joint.

5. Determine the design tensile strength of plate (160 × 8 mm) connected to 10 mm thick gusset using 16 mm bolts, as shown in Fig. if the yield and ultimate stress of the steel used are 250 MPa and 410 MPa, respectively.



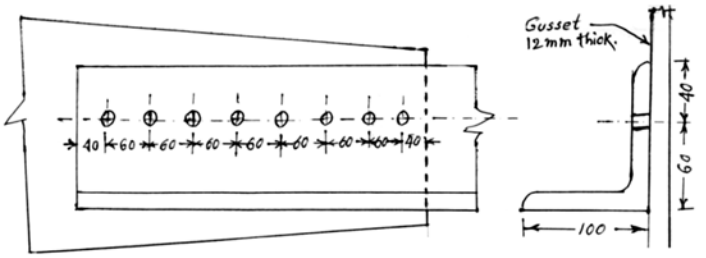
6. Briefly explain the term Web Buckling, Web Crippling and Effect of Sheer Log (for Beam) with diagram.

GROUP – C

(Long Answer Type Questions)

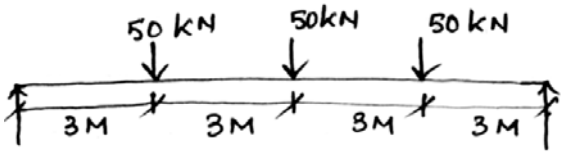
Answer any *three* of the following. 3 × 15 = 45

7. Determine the ultimate strength of L 100 × 100 × 10 in tension which is connected to a gusset 12 mm thick using 8 nos. M 20 bolts in a line as shown in the figure. Take yield and ultimate strengths of steel as 250 MPa and 410 MPa respectively. The bolt grade is 4·6.



8. Design a Laced column with two channels back to back of length 10 m to carry an axial factored load of 1400 KN. The column may be assumed to have restrained in position but not in direction at both ends.

9. Design the main floor beam shown in figure. The beam is laterally restrained. Check for shear and deflection.



(4)

10. A simply supported plate girder of span 10m is subjected to a U.D.L. of 85 kN/m including its own weight. The top flange of the girder is restrained effectively and vertical stiffener are provided. Design the plate girder at centre of span. [use IS-800:1984]

11. A gantry girder of an E.O.T. crane is provided with a section consisting of ISWB 600 @ 1337 N/m and ISMC 300 @ 358 N/m for a span of 8 m. The channel is connected at the top of the beam with the channel flanges down. Find the permissible bending compressive stress and permissible bending tensile stress. [use IS-800 : 1984]

12. State and explain with neat sketches the types of failure of Lap and Butt joints made with black bolts.

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