Seat No

King Mongkut's University of Technology Thonburi

Final Examination
Semester 2 Academic Year 2014

CVE 341: Steel and Timber Design

Date: 18th May 2015 Time 9:00 – 12:00

Instructions :

1. The exam has **5** questions in **14** pages. Total points are **50** points with each question not of equal points.
2. Read the questions carefully and strictly follow instruction.
3. Textbooks and written materials **are allowed** in the examination room.
4. A calculator is allowed.
5. Write your name on every page.
6. Perform your work in the examination paper.

Examiner: Associate Professor Sutat Leelataviwat
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This examination paper has been approved by the Department of Civil Engineering

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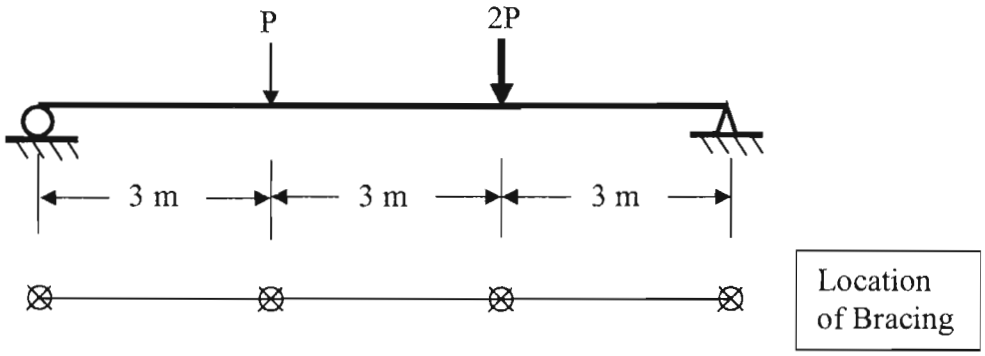
Associate Professor Dr. Sutat Leelataviwat
Head of the Civil Engineering Department

Student Name & I.D._____

1. Investigate beam H500x200x89.6 kg/m SM520 (F_y = 3,700 kg/cm^2) shown to determine how much a concentrated load P the beam can carry. Self-weight can be neglected. The beam has stiffeners at all locations where concentrated loads are applied; therefore, all local failure can be neglected. There is no need to consider serviceability. Use ASD **(10 Points)**

H500x200x89.6 kg/m: b_f = 200 mm, t_f = 16 mm, d = 500 mm, t_w = 10 mm, k = 36 mm, S_x = 1,910 cm^3, Zx = 2,180 cm^3



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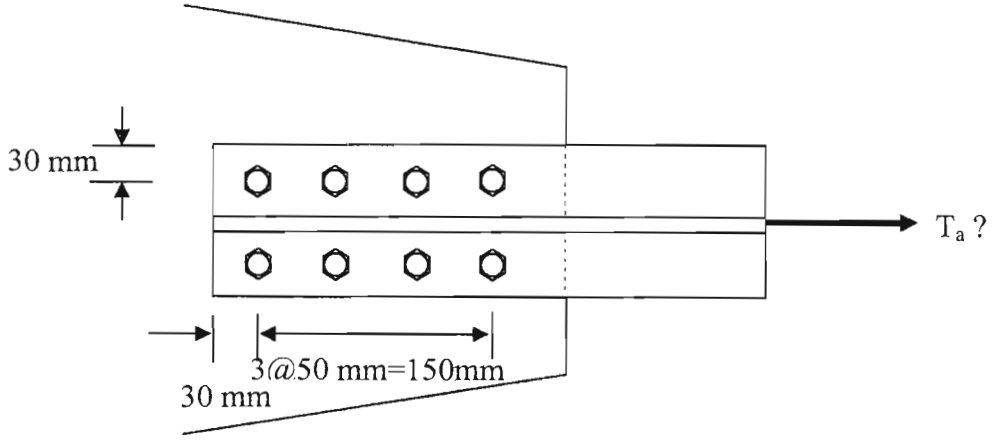
2. Check the tensile strength of the bolted connection connecting T150x150x16.0 kg/m SM400 to the gusset plate as shown. Bolts used are 8-M16 A325N. Assume that the gusset plate is adequate. Use ASD method (**10 Points**)
T150x150x16.0 kg/m: $b_f = 149$ mm, $t_f = 8$ mm, $d = 149$ mm, $t_s = 5.5$ mm, $\overline{y} = 3.26$ cm, $A_g = 20.4$ cm^2



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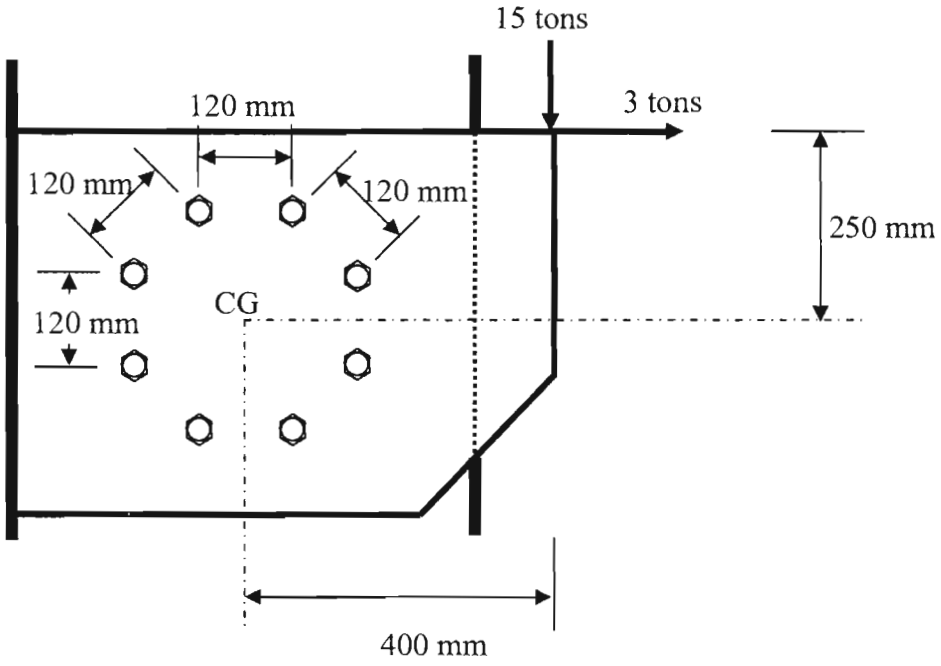
3. According to Feng-shui, a 8-bolted connection is required for a lucky-charm gusset to carry the load as shown. Design the bolt size for A325N bolts to carry the load as illustrated. Use LRFD (**10 Points**)



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4) A steel column (H350x350x12x19 – 137 kg/m) carries the loads as shown below. The member is a part of a braced system, and has supports in the weak direction at supports and mid-height. Use LRFD method (10 Points);

(a) Find the available flexural strength ($\phi_b M_n$) of the member.
(b) Find the available axial compressive strength ($\phi_c P_n$) of the member.
(c) Find the required strength (P_r and M_r) including the second order effect.
(d) Check the adequacy of the member as a beam-column member.

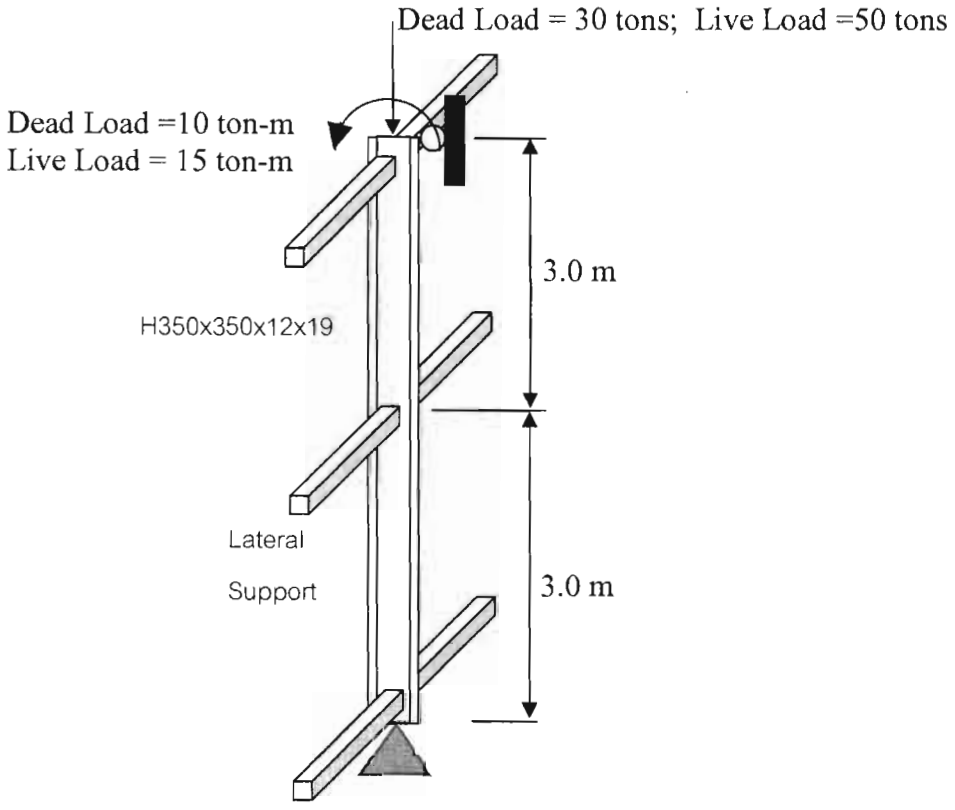

Figure 1

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5) A timber floor framing around a stairway opening is shown below. The left ends of the short joists are supported by a header. The floor self-weight is assumed to be equal to 40 kg/m^{2}for design purpose and the live load is 100 kg/m^2. Assume dense timber with a specific gravity of 0.90. Deflection limit is set at L/240. (10 Points)

a) Design the size of the header to support the given load.Check all the limit states.
b) If the header is connected at its ends to the joist (header-to-joist connection) using 2-4" nails. Determine if this is sufficient. If not, find the required number and size of the nails.

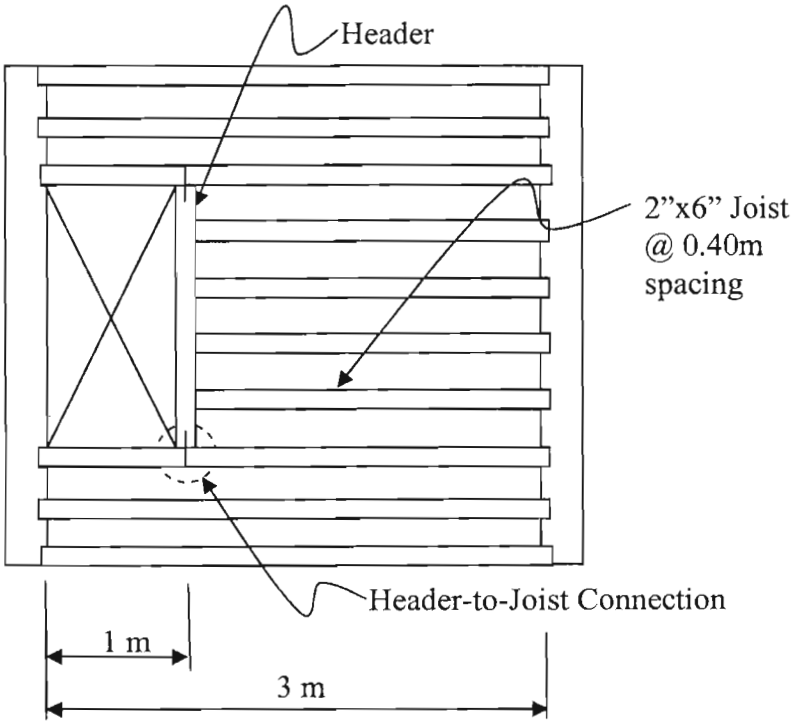

Figure 2

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BEAM FORMULAS