

ENDS 231. Practice Final Examination

Aids Allowed: Two marked 8.5" x 11" crib pages
(2 pages written on one side only
or 1 page written on both sides)

Silent Calculator
Reference Formulas
(Provided at exam time)

Clearly show all your work and record your final answers with the units specified in the boxes.

Problem 1) Worth 45%

- A 17 ft beam with live and dead loading (including a moment) is shown in Figure 1a. The reactions are: $A_x = 0$ k, $A_y = 29.9$ k, $D = 22.9$ k.
- The cross section geometry of the beam is shown in Figure 1b.
- The material is Giggium steel with $E = 32,000$ ksi, $F_b = 60$ ksi, $F_v = 35$ ksi, $F_y = 45$ ksi, and $F_u = 65$ ksi.
- The beam end connection is detailed in Figure 1c. The angle legs are 3/4" thick, with 1 in diameter bolts of A325-SC and oversized round holes.
- The weld material is E60XX

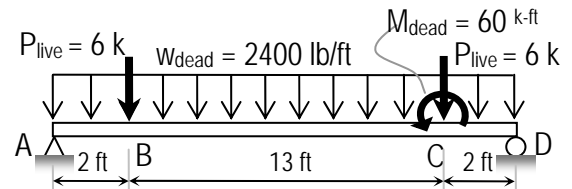


Figure 1a

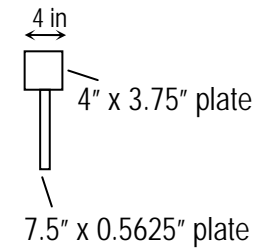


Figure 1b

FIND:

- The shear diagram and V_{max} .
- The bending moment diagram and M_{max} .
- The maximum bending stress in the beam.
- The maximum shear stress in the beam.
- The deflection due to *live load only*.
- The number of bolts at the beam shear connection required for shear at end A.
- The bearing force allowed at the beam shear connection with 2 bolts.
- The length of 1/4" weld for the angle to the column required for shear at end D.

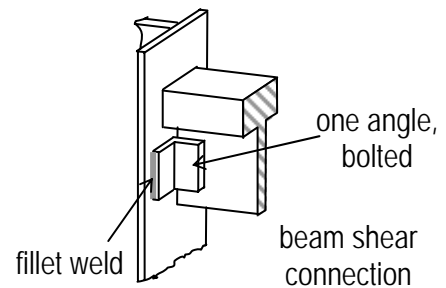


Figure 1c

a)	b) 130.0 k-ft	c)
d) 1021 psi	e)	f) 3 bolts
g) smaller of 87.8 k and 117 k	h)	

WARNING: Correct answers do not receive full credit if the work is not complete or correct.

Disclaimer: Answers have NOT been painstakingly researched.

Problem 2) Worth 45%

- A parallel chord truss is shown in the Figure 2a has the following support reactions: $A_x = 200$ lb, $A_y = 647.5$ lb, $E = 102.5$ lb.
- Snow load and dead load are considered for load duration factor, C_D .
- The truss is constructed with glu-lam lumber having $E = 1.85 \times 10^6$ psi, $\alpha = 3.8 \times 10^{-6}$ /°F, $F_c = 1700$ psi (no adjustment factors), and the allowable tension stress $F_t = 2100$ psi.
- The truss is constructed with 5.125”x10.5” timbers with $I_x = 109.9$ in⁴, and $I_y = 19.1$ in⁴.
- The bottom chord that is continuous the length of the truss is connected as shown in Figure 2b. It is laterally braced at midspan and each end. The joints are considered pinned for analysis.

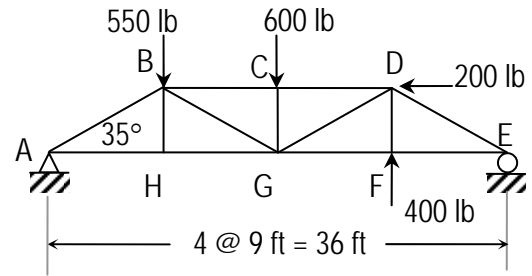


Figure 2a

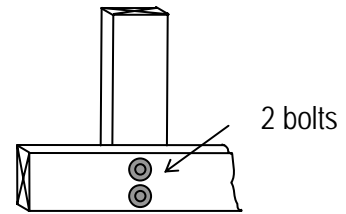


Figure 2b

FIND:

- The member forces in FE using the method of joints.
- The member force in BC using the method of sections.
- The elongation in member AB if the member force is 1128.9 lb (compression).
- The stress in member BC resulting *only* from a temperature increase of 45° F if the member can only lengthen by 0.006 inches.
- The critical value of F_{CE} for the lower chord.
- The allowable buckling load for the lower chord if C_p has been determined to be 0.214 for the weak axis and 0.224 for the strong axis.
- The minimum bolt diameter required with two bolts for tensile strength if the tension force in a lower chord member is 100 kips.

i)	j) -1064.3 lb	k)
l) 214 psi	m) 435 psi	n)
o) 0.815 in		

Disclaimer: Answers have NOT been painstakingly researched.

Problem 3) Worth 10% (conceptual questions)

WARNING: Correct answers do not receive full credit if the work is not complete or correct.