



University Of Technology
Building and Construction Eng. Dept.
Final Exam – First Attempt – 2010/2011



Subject : Design of Steel Bridges Class: Fourth
Branch : Highways and Bridges Time : 3 Hours
Examiners : Dr. Wael Shawky Open Books and Notes

Note: Answer three questions only Date: 9/6/2011

Q1: For the 2C12 x 20.7 tension member GH in the truss shown in figure 1, the tension force is 170k, $F_y=36$ ksi and $F_u=58$ ksi:

- 1- Based on the strength of the gross area and the maximum effective net area of the section, check if the member is safe to carry the applied tension load or not.
- 2- The connection drawing at joint G is shown in figure 2-a. Check no. of bolts, spacing and edge distance of the connection if 1" diameter A490 bolts, threads are included in the shear planes, standard holes and bearing type connection.
- 3- Re calculate the maximum allowable tension force for the same member for failure modes 1-1, 2-2 and 3-3 as shown in figure 2-b.

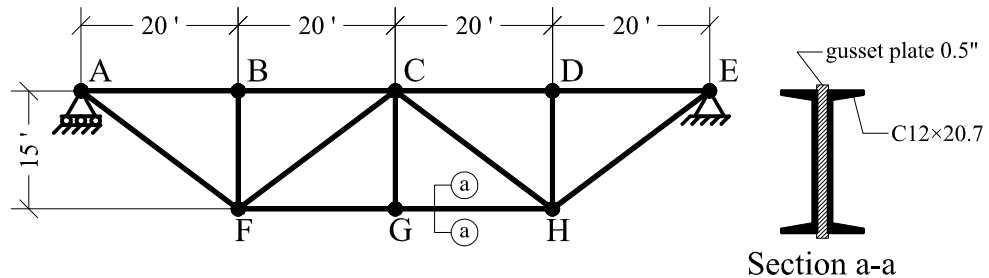


Figure 1

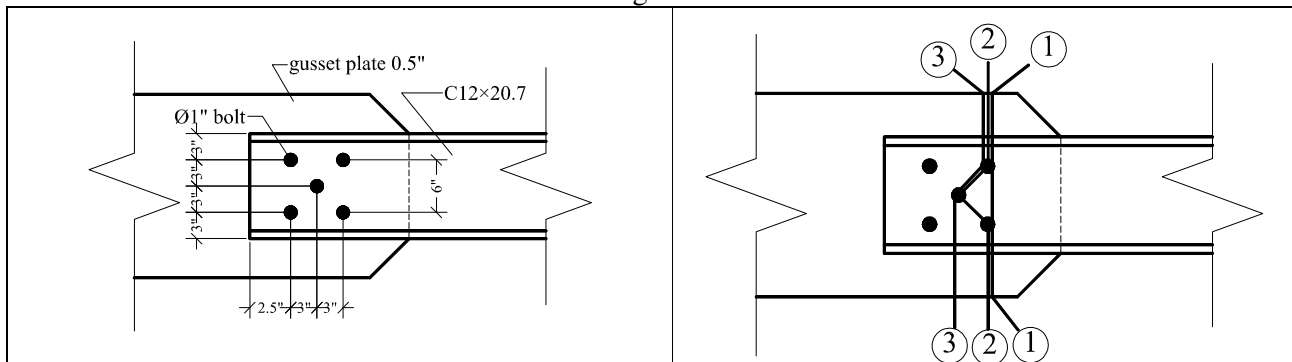
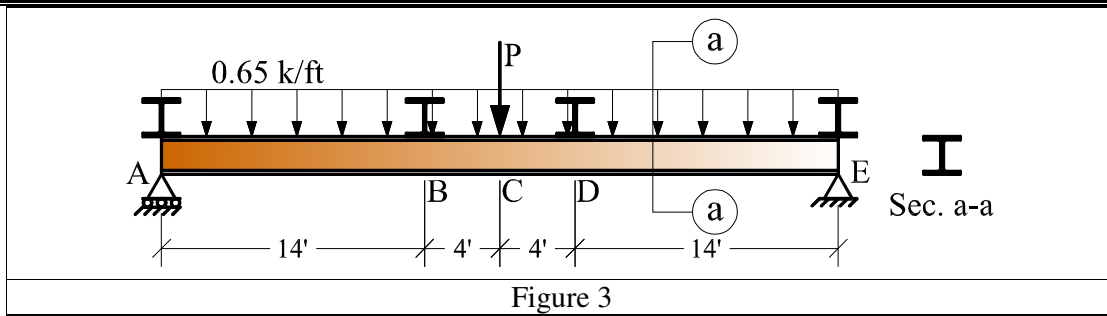


Fig. 2-a

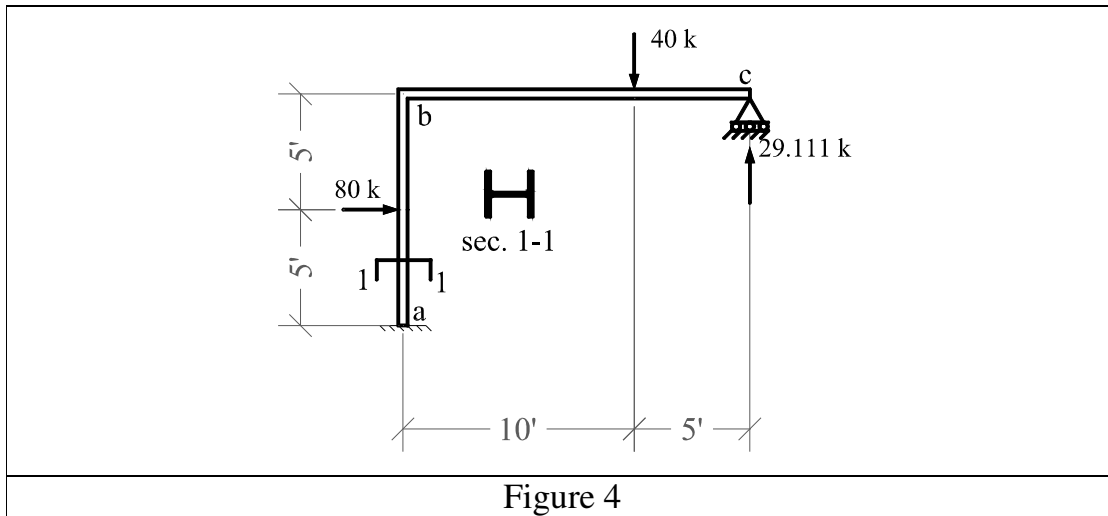
Fig. 2-b

Q2: Check the adequacy of 2L6 x 6 x 1 with 1/2" gusset plate member ED in truss on figure 1 to carry an axial compressive load 175 k, Also check the local buckling and design the longitudinal bolt spacing. $F_y=36$ ksi.

Q3: For the beam in figure 3 below, lateral supports were provided at points A, B, D and E, a uniform distributed load of 0.65k/ft was applied on the beam. Find the allowable load P that can be safely applied to the beam using W12 x 120 section. Check for flexural strength, shear strength and local web yielding. (Do not design the stiffeners, $N=8$). $F_y = 36$ ksi . Neglect the beam self-weight.



Q4: Design member ab shown in figure 4 using W14 x w steel section. Check for flexural and shear strength only. Use $k_y = 1$ and $F_y = 36$ ksi. Given:
 Maximum moment = 363.333 k.ft (at the fix support).
 Maximum axial load = 10.889 k.
 Maximum shear = 80 k.



Q5: It is required to use cover plates and W12 x 72 steel section to carry the loading case shown in figure 5. Beam AD has a full lateral support. Design the dimensions of the cover plates and connect them to the steel section. The cover plates are to be rivet connected. The following information are available:
 $F_y = 36$ ksi, R single shear for the rivet = 7 k.

