

### CVEN 221 Honors – Homework #17

- 1) A Pratt steel truss is to be designed to support three 10-kip loads as shown. The length of the truss is to be 40 ft. The height of the truss and thus the angle,  $\theta$ , as well as the cross-sectional areas of the various members, are to be selected to obtain the most economical design. Specifically, the cross-sectional area of each member is to be chosen so that the stress (force divided by area) in that member is equal to 20 kips/in<sup>2</sup>, the allowable stress for the steel used, the total weight of the steel, and thus its cost, must be as small as possible. (a) knowing that the specific weight of the steel used is 0.284 lb/in<sup>3</sup>, write a computer program that can be used to calculate the weight of the truss and the cross-sectional area of each load-bearing member located to the left of DE for values of  $\theta$  from 20 to 80 degrees using 5 degree increments. (b) Using appropriate smaller increments, determine the optimum value of  $\theta$  and the corresponding values of the weight of the truss and of the cross-sectional areas of the various members. Ignore the weight of any zero-force member in your computations.

