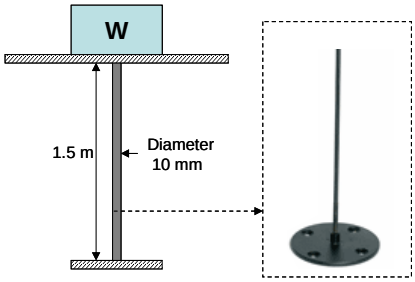
Mechanics-Based Design Spring 2008
Examine Time: 50 min
April 11, 2008

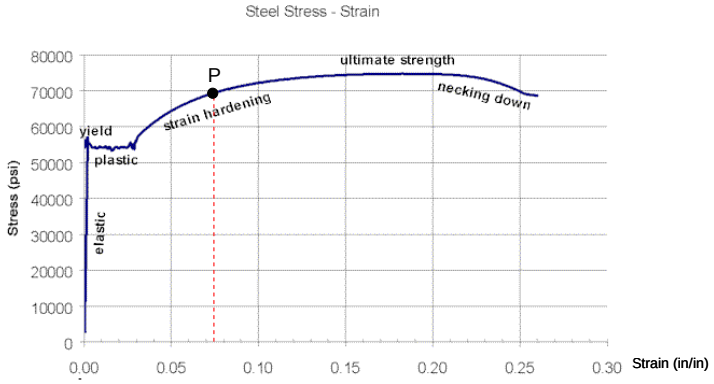
Name: _____

Midterm Exam - II

1. Under a certain circumstance, a coffee table (see figure below) will be temporarily used as a work station. It is known that the table leg is made of solid round steel (hot-rolled AISI 1020 steel). If a safety factor of 3 is desired, what is the maximum weight that can be put on the table? Assuming the weight will be place right in the center of table.



2. The figure below shows the stress-strain curve of AISI cold-drawn 1045 steel. What are the values of σ, ε, σ_T, and ε_T when a specimen made of the steel is loaded to point P. Next, the specimen is un-loaded. Treating it as a new specimen, it is re-loaded to point P. What is the cold-work factor for this new specimen? What are the values of the same quantities for the new specimen? (Hint: assuming no volume change in the specimen)



3. The figure below shows an electrical motor loaded by a belt drive. The shaft is to be made of ASTM grade 25 cast iron using a design factor of 4. What diameter should be used for the shaft.