

## MEEG3311 Homework 6 – Chapter 7

### 6.1

The connecting rod shown here drives the piston of a vacuum pump. The axial force on the piston rod varies between 95 kN of tension during suction and 15 kN compression during returning in fully loaded operation. The rod material is AISI 1060 steel, annealed.

If the rod has a cross sectional area equivalent to a 15 x 30mm rectangle, what would the factor of safety be for its having infinite life?

Assume:

- 1) that all the modifying factors are equal to one, and
- 2) that the loads would increase proportionately.

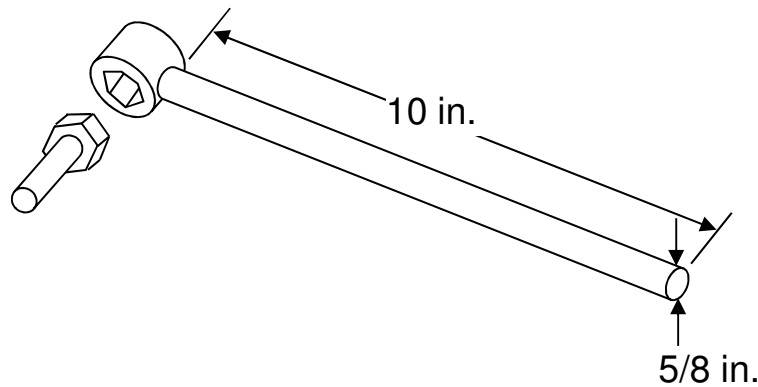


## 6.2

- A. If the wrench shown here is used on an assembly line for tightening bolts to 60 ft.lb. of torque, and the wrench material is AISI 1020 steel Q&T 870°C, what is the factor of safety against fatigue failure?

Assume: 1) all fatigue correction factors are equal to one, 2) the highest stress is at the joint between the handle and the “socket”, and 3) there is no stress concentration at the joint.

Draw the load plot, stress plot, and appropriate fatigue diagram.



- B. If this same wrench is used in a repair shop where it both removes and retightens bolts requiring 85 ft.lb. of torque, how many bolts will the wrench be able to do?

Draw the load plot, stress plot, and appropriate fatigue diagram.

### 6.3

A steel ball bearing 2 inches in diameter drops from a 9-foot height onto a coil spring that has a spring constant of 600 lb/in.

If steel has a density of  $0.282 \text{ lb/in}^3$ , what is the maximum force that the spring sees, and what is the maximum deflection of the spring?

If the ball was travelling horizontally into the spring, how fast would it have to be going to cause the same deflection in the spring?