



King Fahd University of Petroleum & Minerals
College of Engineering Sciences
Mechanical Engineering Department

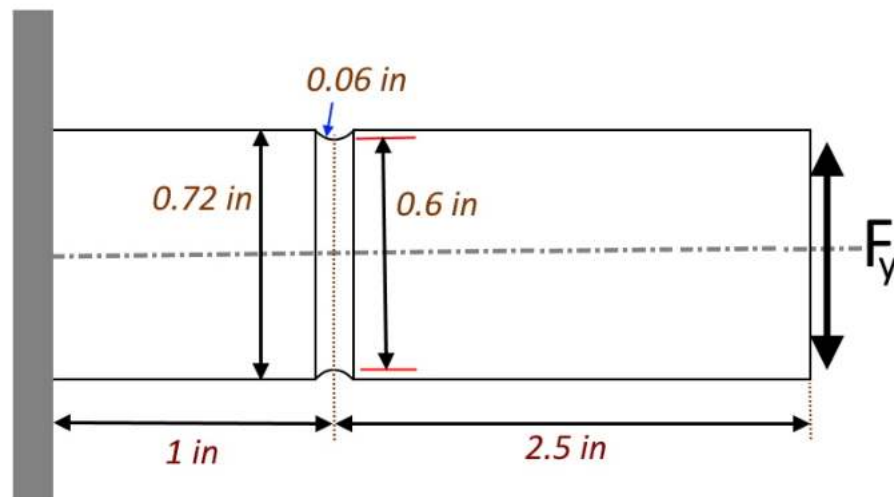
Chapter 6 & 7– Fatigue Failure Resulting from Variable Loading

Due Date – 18/03/2020

Problem 1 (15 Marks)

A cantilevered round shaft with groove is to be used for application that involves non-rotating cyclic bending load at temperature of 200 °C such that a life of 500,000 cycles must be sustained with 90% reliability. If the shaft is made of AISI 1018 cold rolled steel with $f=0.9$:

- What is the maximum completely reversed force F_y ?
- If the shaft is subjected to maximum bending load of $F_y = 100 \text{ lbf}$, find the factor of safety for infinite life.



Problem 2 (10 Marks)

A rectangular bar is cut from an AISI 1020 cold-drawn steel flat. The bar is 2.5 in wide by 3/8 in thick and has a 0.5-in-dia. notch drilled as depicted in Figure below. The bar is concentrically loaded in push-pull fatigue by axial forces F , uniformly distributed across the width. Using a design factor of $n = 2$, estimate the largest force F that can be applied if infinite life is desired. [Hint: Ignore column action]

