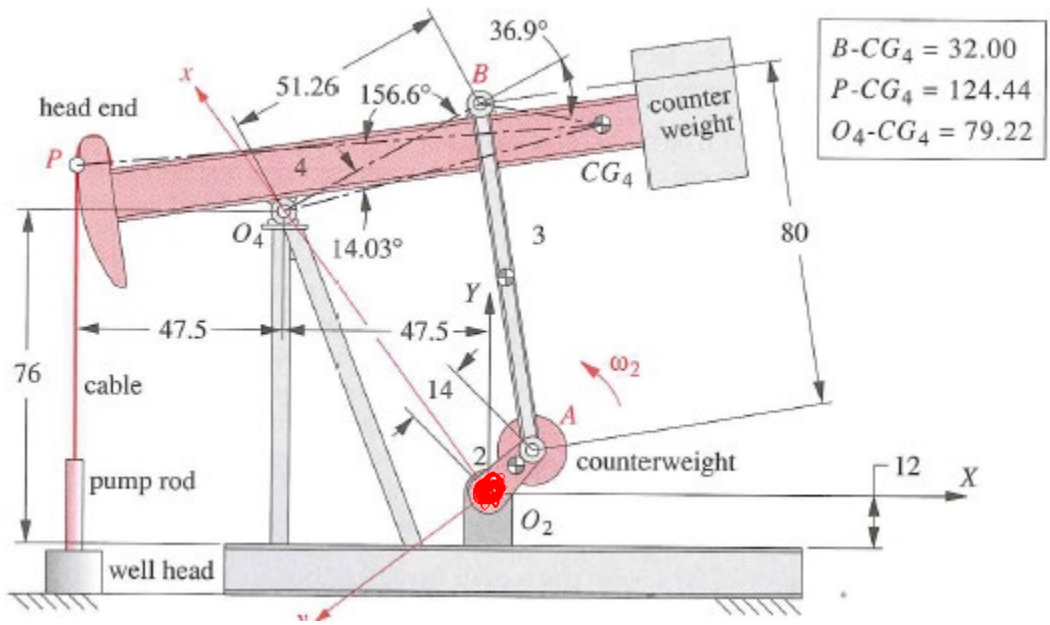
ME 360 – H02 Name _____

USE THIS SHEET AS THE FIRST PAGE OF YOUR HOMEWORK SUBMISSION

1) A cylindrical steel tank with hemispherical ends holds 200 psi of compressed air. Determine factor of safety if the tank is 0.5 m DIA and 1.8 m long with 1.5 mm wall thickness. The steel has yield strength of 420 MPa.

N_Y _____

2) The drive shaft of the oil pump shown below is loaded in torsion at 10,000 in.lbf and bending at 13,000 in.lbf. Units in the figure are inches. Determine diameter for 1045 cold rolled steel fully keyed shaft available from McMaster-Carr www.mcmaster.com to provide factor of safety against yield $N_Y \geq 3$. Do not include stress concentration for the keyway. What is the cost for a two foot length of this shaft? What is the width of the key used for your shaft?



DIA _____ inch cost _____ w_{KEY} _____ inch

3) The connecting rod AB in the oil pump shown above is actually two rods, one on each side of the crank O_2A and the beam O_4B. Maximum tensile load on each bar is 5000 lbf. Determine suitable width for 0.5 inch thick 1018 cold rolled steel square or rectangle stock available from Online Metals www.onlinemetals.com to provide factor of safety against yield $N_Y \geq 5$. Material properties are available at http://www.onlinemetals.com/productguides/steelguide.cfm Do not include stress concentrations at A and B. What is the cost for one bar using available sizes? What is the weight for one bar? **DO NOT USE CUSTOM CUT FOR LENGTH.**

w _____ inch cost _____ weight _____ lbf

4) Repeat problem 3) above, however use 0.5 inch thick 6061 aluminum square or rectangle stock available from Online Metals www.onlinemetals.com Do not include stress concentrations for connections at A and B. Material properties are available at https://www.onlinemetals.com/productguides/aluminumguide.cfm What is the cost for one bar using available sizes? What is the weight for one bar? **DO NOT USE CUSTOM CUT FOR LENGTH.**

w _____ inch cost _____ weight _____ lbf