FoS = 2.3    Reliability = 95%    Cold Rolled 1030

machined    d = 60 mm    torsion    $S_{ut} = 524$ MPa


- $C_{load} = 1$    $\Rightarrow$ torsion

- $C_{size} = 1.189 \, d^{-.897}$    $\Rightarrow$ 8mm < 60mm < 250 mm

    $= .7993$

- $C_{surf} = \min(A(S_{ut})^b, 1)$    $A = 4.51, \ b = -.265$

    $= .8577$

- $C_{temp} = 1$

- $C_{reliab.} = .868$

- $S_e' = .5 \cdot S_{ut} = .5(525) = 262.5$

$S_e = S_e' \cdot C_{load} \cdot C_{size} \cdot C_{surf} \cdot C_{reliab} \cdot C_{temp} = 156$

$\Rightarrow S_m = .9 \, S_{ut}$

$b = \dfrac{1}{\log(1000) - \log(10^6)} \log\left(\dfrac{S_m}{S_e}\right) = -.1607$    $\Rightarrow$    $A = \dfrac{S_m}{1000^b}$

$N = \left(\dfrac{S_n}{A}\right)^{1/b}$

```matlab
%% HW 4
clear
clc
%% P1
p = [125; 64; -51];
d = 60;
sig_vm = sqrt(p(1).^2 + p(2).^2 + p(3).^2 - ...
(p(1)*p(2)+p(2)*p(3)+p(3)*p(1)));

%% P2

FOSf = 2.3;

strength = FOSf*sig_vm;
A95 = .010462*(d.^2);
deq = sqrt(A95/.07066);

Csize = 1.189*60.^(-.097);
Csurf = min(4.51*524.^(-.265),1);

Sm = .9*524;
Strengthe = Csize*Csurf*.868*.5*524;
b = (1/(log(1000)-log(1000000)))*log(Sm/Strengthe);
a = Sm/(1000.^(b));

N = (strength/a).^(1/b);
```