Program for Design of Springs, Problem 2 .

Problem Statement:

Problem Statement: It is required to design a helical compresion spring for the valve mechanism. The axial force acting on the spring is 300 N when the valve is open adn 150 N when the valve is closed. The length of the spring is 30 mm when the valve is open and 35 mm when the valve is closed. The spring is made of oil hardened and tempered valve spring wire and the limate tensile strength is 1,370 N/mm2. The permissible shear stress for the spring wire should be taken as 30% of the ultimate tensile strength.The modulus of rigity is 81,370 N/mm2. The spring is to be fitted over a valve rod and the minimum inside diameter of the spring should be 20 mm. Design the spring and calcuate:

i) Wire diameter

ii) Mean coil diameter

iii)Number of active coils

iv) Total number of coils

v) Free length of the sprin

vi) Pitch of the coil

Assume the clearance between adjacent coils or clash allowance is 15% of the deflection under the maximum load.

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clc;

clear all;

Intialing the given data:

F\_max = 300

F\_min = 150

y\_max = 35

y\_min = 30

Di = 20

S\_u = 1370

G = 81370

Finding the wire diameter:

syms d

tau = 0.3\*S\_u

D = Di + d

K = 1

d=vpasolve(tau==(8\*F\_max\*D\*K)/(pi\*d^3),d);

d=ceil(d(1))

Finding the mean coil diameter:

D=Di+d

C=D/d

[K] = Eqn11\_2\_a(C);

[tau\_ind] = Eqn11\_1d(F\_max,D,K,d);

if tau\_ind < tau

disp("Design is safe")

else

disp("Design is not safe")

end

Finding the number of active coils:

F = F\_max - F\_min

y=y\_max-y\_min

[N]=Eqn11\_5a\_i(F,D,G,d,y)

N=ceil(N)

Finding the number of coils:

[Nt,f] = Table\_11\_4(N)

Finding the free length of the spring:

[y\_act]=Eqn11\_5\_a(F\_max,D,G,d,N);

S\_L=Nt\*d

T\_ag=0.15\*y\_act;

F\_L=ceil(S\_L+T\_ag+y\_act)

Pitch of the coil:

p=ceil(F\_L/(Nt-1))