Program for Design of Springs, Problem 6 .

Problem Statement: A railway wagon moving at a velocity of 1.5 m/s is brought to rest by a bumper consisting of two helical springs arranged in parallel. The mass of the wagon is 15000 kg.. The sprngs are compressed by 150 mm in bringing the wagon to rest. The sprin index can be taken as 6. The springs are made of oil- hardened and tempered steel wire with ultimate tensile strength of 12500 N/mm^2 and modulusof rigidity of 81370 N/mm^2. The permissible shear stress for the sprng wire can be taken as 50% of the ultimate tnesile strength. Design th spring and calculate:

i) Wire diameter

ii) Mean coil diameter

iii) Number of active coils

iv) Total number of coils

v) SOlid length

vi) Free length

vii) pitch of the coil

viii) Require stifness of the spring

ix) Actual stifness of the spring

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clc;

clear all;

Intializing the given values:

m = 1500

v = 1.5

y = 150

S\_u = 1250

C = 6

G = 81370

Finding the wire diameter:

KE=0.5\*m\*(v^2)\*1e3;

syms F

E = 2\*(0.5\*F\*y);

F=vpasolve(KE==E,F);

tau=0.5\*S\_u;

[K]=Eqn11\_2a(C)

[d]=Eqn11\_1d\_d(F,C,K,tau);

[d]=Round(d)

Finding the mean coil diameter:

D=C\*d

Finding the number of active coils:

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

N=ceil(N)

Finding the total number of coils:

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

Finding the solid strength:

S\_L=Nt\*d

Finding the free length of the spring:

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

g=2

T\_ag=(Nt-1)\*g

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

[F\_L]=ceil(F\_L)

Finding the pitch of the coil:

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

Finding the required spring rate:

k=F/y

Finding the actual spring rate:

k\_act=ceil((G\*d^4)/(8\*D^3.\*N))