Program for Design of Spur Gear, Problem 3.

Problem Statement: In a spur gear arrangement, a pinion made of cast steel is rotating at 900 rpm and is driving a cast iron gear at 150rpm. The teeth are to have standard 20 degree stub involute profiles and the maximum power to be transmitted is 25 kW. Determine the module and face width. Find the dynamic and wear load also. The pinion has 16 teeth with surface hardness of 250 BHN, take static stress for pinion as 103 MPa and for gear as 55 MPa. Assuming Ep = 96 GN/m^2 and Eg = 207 GN/m^2

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clc;

clear all;

Intializing the given data from the question:

N1 = 900

N2 = 150

alpha = 20

P = 25

z1 = 16

S\_d1 = 103

S\_d2 = 55

Ep = 96\*10^3

Eg = 207\*10^3

Finding the velocity ratio and the number of teeth on pinion and gear respectiely:

i = N1/N2

z1

z2 = z1\*i

Finding the lewis form factor:

[y1]=Lewis(z2)

[y2]=Lewis(z2)

Finding the strength factor to decide what the design is based on:

if S\_d1\*y1<S\_d2\*y2

disp("Design is based on pinion")

S\_d=S\_d1;

Y=pi\*y1;

z=z1;

else

disp("Design is based on gear")

S\_d=S\_d2;

Y=pi\*y2;

z=z2;

end

Finding the module and standardizing it:

Mt = ((P\*1000\*60)/(2\*pi\*N2))\*10^3;

k = 10

Cv = 0.5

[m] = Eqn\_12\_5\_b(Mt,S\_d,Cv,k,Y,z)

[m] = Tb12\_2\_1a(m)

Finding the PCD of pinion and gear respectively:

d1 = m\*z1

d2 = m\*z2

Finding the face width, velocity and Tangential Force :

b = 10\*m

v = (pi\*d2\*N2)/(1000\*60)

if v<=8

Cv1 = 3.05/(3.05+v);

elseif v>8 && v<=13

Cv1 = 4.58/(4.58+v);

elseif v>13 && v<=20

Cv1 = 6.1/(6.1+v);

elseif v>20

Cv1 = 5.55/(5.55+sqrt(v));

end

Ft = (2\*Mt)/(d2)

Verifying if the values found are satifactory:

S\_d22 = Ft/(pi\*Cv1\*b\*y2\*m\*10^3);

if S\_d22 >S\_d2

disp('Values are not satisfactory');

else

disp('Values are satisfactory');

end

Finding the dynamic load:

K3 = 20.67

e = Table\_12\_14(v)

k1 =8.7;

C = e/(k1\*(Ep^-1 + Eg^-1))

[Fd] = Eqn\_12\_12(Ft,K3,v,C,b);

Fd = Fd\*10^-3

Finding the Wear and finding if the material is safe against wear:

[Q] = Eqn\_12\_15\_c(z1,z2)

S\_es = 617.8;

[K] = Eqn\_12\_15\_b(S\_es,alpha,Ep,Eg);

[Fw] = Eqn\_12\_15\_a(K,Q,b,d1)

if Fw>Fd

disp('Material is Safe against wear');

else

disp('Material is not safe against wear');

end