Program for Design of Helical Gear, Problem 5.

Problem Statement : Design pair of equal diameter 20 degrees stub teeth helical gears to transmit 37.5 kW with moderate shocks at 1200 rpm. The two shafts are parallel and 0.45 m apart. Each gear is made of steel with β = 30 degrees

Date: 19/10/2020

Name: Avva Sai Pranav

USN: PES1201800861

clc;

clear all;

Intialization of the given data:

P = 37.5

alpha = 20

a = 0.45

Finding the velocity ratio:

syms d1 d2 z1 z2

d1 = d2

i = d2/d1

beta = 30

N1 = 1200

N2 = i\*N1

Finding the virtual number of teeth:

z\_p = 20

z\_g = i\*z\_p

z\_ep = Eqn\_12\_22\_a(z\_p,beta)

Finding the module:

Mt = (60\*P\*1e6)/(2\*pi\*N1);

Cw = 1.15;

Cv = 0.5;

syms b m\_n

k = b/m\_n

k = 15;

m\_n = (a\*cosd(beta)\*2)/(z\_p + z\_g)

FInding the diameter of both motor and compressor gears:

d\_p = Eqn\_12\_19\_e(z\_p,m\_n,beta)

d\_g = i\*d\_p

Finding the face width and verfying if its within safe permissible stress:

b = k\*m\_n

b\_min = Eqn\_12\_23\_b(m\_n,beta)

if b>b\_min

disp('Calculated value for b is safe')

else

disp('Calculated value for b is not safe')

end

Finding the stress inuced and verfying it they are satisfactory:

y = Eqn\_12\_5\_d(z\_ep)

Y = pi\*y;

S\_d = (2\*Mt\*Cw\*cosd(beta))/(m\_n^3\*Cv\*k\*Y\*z\_p)

v = (pi\*d\_p\*N1)/(60\*1000)

Cv = Eqn\_12\_25(v)

Cs =1;

Ft = ((2\*Mt)/d\_p)\*Cs;

S\_ind = Eqn\_12\_24\_a(Ft,Cw,Cv,b,Y,m\_n)

if S\_ind < S\_d

disp('The assumed values are satisfactory')

else

disp('The assumed values are not satisfactory')

end

Dynamic tooth load:

K3 = 20.67;

e = Table\_12\_14(v)

[C] = Table\_12\_12\_1(e)

Fd = Eqn\_12\_26\_a(v,C,Ft,K3,b,beta)

Dynamic strength of the gear and verfying if its sage against static tooth load:

Fs = Eqn\_12\_26\_b(S\_d,b,Y,m\_n)

if Fs >= Fd

disp('The material is safe against static tooth load')

else

disp('The material is not safe against static tooth load')

end

Find the transverse module and normal pressure angle:

[m] = Eqn\_12\_19\_c(m\_n,beta)

[alpha\_n] = Eqn\_12\_22\_b(alpha,beta)

Finding the axial pitch:

p = pi\*m;

p\_a = p/tand(beta)

Finding the addendum circle diameter and the dedendum circle diameter of the pinion:

d\_ap = m\_n\*((z\_p/cosd(beta))+2)

d\_dp = m\_n\*((z\_p/cosd(beta))-2.5)

Finding the tangential, axial and radial force components on the gear i.ie gear tooth loads:

[Ft,Fa,Fr] = Figure12\_7(Mt,d\_p,beta,alpha\_n);

eval(Ft)

eval(Fa)

eval(Fr)