Program for Design of Bevel Gear, Problem 9.

Problem Statement: A pair of straight tooth bevel gears at right angles is to transmit 5kW at 1500 rpm of the pinion at a speed raio of 3. Diameter of pinion is 75 mm. The tooth form is 14.5 degrees involute p. Pinion is made of steel (S\_d =160 MPA) and gear of CI(S\_d =80 MPA). Design the gear pair and check the design for dynamic load wear.

Date: 21/10/2020

Name: Avva Sai Pranav

USN: PES1201800861

clc;

clear all;

Intializing the variables:

theta = 90

P = 5

N1 = 1500

d1 = 75

ii = 3.5

alpha = 14.5

S\_dg = 80

S\_dp = 160

Finding the diameter and rpm of the gear:

d2 = ii\*d1

N2 = N1/ii

As both are made of the same material , pinion is weaker. Finding the pitch angel using equation 12.32(a):

del\_p = Eqn\_12\_32\_a(ii)

del\_g = Eqn\_12\_32\_b(ii)

Finding the number of virtual teeth for pinion and gear:

z1 = 24

z2 = ii\*z1

ze = Eqn\_12\_25\_d(z1,del\_p);

zep =ze

ze = Eqn\_12\_25\_d(z2,del\_g);

zeg =ze

Find the velcoity and the velocity factor:

v = ((pi\*d1\*N1)/(60))

%Cv = ((6.1)/(6.1+v))

Cv = 0.5482

Finding the tangential force using equation 12.38(b):

Ft = ((1000\*P)/(v))

Finding the format using expression below equation 12.37:

Y = pi\*(0.124-((0.684)/(zep)))

Fnding the cone using equation 12.33:

L = 0.5\*(sqrt(d1^2+d2^2))

Finding the face width usign equation 12.36(b)

b = L/3

m = ((Ft\*1000)/(S\_dg\*Cv\*b\*Y))\*((L)/(L-b));

m = Table\_12\_24(m);

m = 4

Findthen number of teeth on gears and pinion:

z1 = d1/m

z2 = d2/m

Finding the zep and zeg values :

ze = Eqn\_12\_25\_d(z1,del\_p);

zep =ze

ze = Eqn\_12\_25\_d(z2,del\_g);

zeg =ze

Finding the induced streess and the new form factor:

Y\_new = pi\*(0.124- ((0.684)/(zep)))

S\_d\_ind = ((Ft\*1000)/(Ft\*Cv\*b\*Y))\*((L)/(L-b))

if S\_dg > S\_d\_ind

disp("The calculated values are less than permissible values hence the assumed values are satisfactory.");

else

disp("The calculated values are greater than permissible values hence the assumed values are not satisfactory.");

end

Finding the dynamic tooth load:

K3 = 20.67

e1 = 0.0640

e2 = 0.06

C = 353.39

C = C/e2 \* e1

Fd = Ft + ((K3\*v\*(C\*b+Ft))/(K3\*v+sqrt(C\*b+Ft)))

For wear load(Fw) :

Q = ((2\*zeg)/(zep+zeg))

K = 1.324

Fw = ((d1\*b\*Q\*K)/(cos(del\_g)))

if Fw >= Fd

disp("Safe against wear");

else

disp("Not safe against wear");

end