Program for Design of Bevel Gear, Problem 8.

Problem Statement: A pair of straight bevel gears transmits 15kw at 1250 rpm and 120 diameter pinion. The speed reduction is 3.5. Use 14.5 degree invlute tooth system The angle between the shaft azes is 90 degrees. The pinionis made of case hardened alloy steel with allowable static stress of 343.34 MPa and gear is cast stell of 0.20%C heat treated with allowable static stress of 191.295 MPa. Determine:

i) Module

ii) Face width

iii) Number of teeth on pinion and gear.

Take the service factror as 1.5 and assume the teeth are generated.

Date: 21/10/2020

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clc;

clear all;

Intializing the variables:

theta = 90

P = 15

N1 = 1250

d1 = 80

ii = 3.5

alpha = 14.5

S\_dp = 343.34

S\_dg = 191.295

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