Program for Design of Worm Gear, Problem 7.

Problem Statement:Design a worm gear drive to transmit 2 kW of power at 1000 rpm. The speed ratio is 20 and centre distance is 200 mm. Assume the number of teeth on worm wheel to be 40 and number of starts on worm to be 2. Assume hardened steel worm and phosphor bronze wheel for which σd = 55 N/mm2 . Check the gear from stand point of strength and wear if load stress factor, K = 0.69 MPa. If the amount of heat generated is 1.7 kW, check whether artificial cooling is necessary or not for a temperature rise for 40 degree C.

Date: 7/11/2020

Name: Avva Sai Pranav

USN: PES1201800861

clc;

clear all;

Intializing the given data:

P = 2;

ii = 20;

alpha = 14.5;

a = 200;

N1 = 1e3;

n1 = N1/60;

z2=40;

S\_d2 = 55;

Qg=1.7;

Dt=40;

Finding n2 using equation 12.68(b)

[n2] = Eqn\_12\_68\_b\_n2(n1,ii)

The worm gear is assumed to be weaker than worm since it is subjected to sliding action, thereby resulting in over heating and leading to failures. The diameters d1 and d2 are found as per AGMA using equation 12.51(a):

[d1] = Eqn\_12\_51\_a(a)

[d2] = Eqn\_12\_47\_a(a,d1)

z1 = 2

Finding the permissible tooth load and Moment:

[Mt] = Eqn\_3\_3\_a(P,n2)

K = 1

[Ft] = Eqn\_12\_53\_d(K,d2,Mt)

Finding the pitch line velocity of the gear and the velocity factor:

[v] = Eqn\_12\_48\_b(d2,n2)

[Cv] = Eqn\_12\_53\_c(v)

Finding the face width using equation 12.64:

[b] = Eqn\_12\_64(a)

Finding the module m using equation 12.53(a):

y = 0.1

[m] = Eqn\_12\_53\_a\_m(Ft,S\_d2,Cv,b,y)

m = 3

Finding the lead angle using equation 12.64(e):

[gamma] = Eqn\_12\_46\_e(m,d1,z1)

Finding the dynmaci strength of gears:

Y = pi\*y

[Fs] = Eqn\_12\_54(S\_d2,b,Y,m)

Finding the wear tooth load:

K=0.69

[Fw] = Eqn\_12\_62\_a(d2,b,K)

if Fw>Fs

disp("The material is safe against wear")

else

disp("The material is not safe against wear")

end

Finding vr using equation 12.60(b):

vr = ((pi\*d1\*n1)/(1000\*cosd(gamma)))

if vr > 2.75

mu = 0.025 + ((3.281\*vr)/(1000))

else

mu = ((0.0422)/(vr^(0.28)))

end

Finding the efficiency using equation 12.57( C):

[theta,eta] = Eqn\_12\_57\_c(alpha,gamma,mu)

Finding the normal force:

[Fn] = normal\_force(Ft,gamma,alpha)

Fing the heat dissipated using equation 12.63 (b):

Ag=(pi\*d2^2)/4

Lw=(14.14+0.063\*z1)\*m

Aw=Lw\*d1

[Qd]=Eqn\_12\_63\_c(Ag,Aw,Dt)

if Qd>Qg

disp("Artificial cooling is not necessary");

else

disp("Artificial cooling is necessary");

end