Program for Design of Helical Gear, Problem 3.

Problem Statement: A pair of helical gears is to transmit 15 kW. The teeth re 20 degree stub in diametral plane and have a helix angle of 45 degree . The pinion runs at 10000 rpm and has 80 mm pitch diameter. The gear has a pitch diameter of 320 mm. If the gears are made of cast steel having allowable static strength of 100 MPa; determine module and face width from static strength considerations and check the gears for wear, given stress endurance is 618 MPa.

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clc;

clear all;

Intializing the given :

P = 15

alpha = 20

beta = 45

N\_p = 1e4

d\_p = 80

d\_g = 320

S\_p = 100

S\_g = S\_p

S\_es = 618

Finding the velocity ratio and the virtual number of teeth:

i = d\_g/d\_p

z\_p = 20

z\_g = i\*z\_p

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

Finding the strength factor and dependent of pinion and gear:

SF\_p = S\_p\*Eqn\_12\_5\_e(z\_p)

SF\_g = S\_g\*Eqn\_12\_5\_e(z\_g)

SF\_min = min(SF\_p,SF\_g)

Finding the module:

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

Cv = Eqn\_12\_25(v)

Cs = 1

Ft = Eqn\_12\_7\_a(P,Cs,v)

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

Y = pi\*y

Assuming k and Cw referring table 12.21:

syms b m\_n

k = b/m\_n

k = 15

Cw = 1.15

Find the module:

m\_n = Eqn\_12\_24\_b(Ft,Cw,S\_p,Cv,k,Y)

m\_n = Table\_12\_2(m\_n)

Find the nuber of teeth in pinion:

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

Finding the number of teeth on gear:

z\_g = i\*z\_p

Finding the virtual number of teeth:

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

z\_eg = i\*z\_ep

Finding the face width and verifying the claculated value is safe or not:

b = ceil(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 dynamic tooth load from table 12.12 for cast steel:

K3 = 20.67;

e = Table\_12\_14(v)

m\_n = Table\_12\_2(m\_n)

C = 474.6

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

Limiting load for wear and verifying if its in the permissible limits or not:

E1 = 2.1\*1e5;

E2 = E1;

Fw = Eqn\_12\_26\_c(S\_es,alpha,E1,E2,d\_p,d\_g,b,beta)

if Fw>Fd

disp('The material is safe against wear')

else

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

end