Program for Design of Helical Gear, Problem 4.

Problem Statement:The following data refers to the design of a helical gear drive:

i. Power transmitted 34 kW at 2,800 rpm of pinion

ii. Speed ratio 4.5, number of teeth on pinion 18

iii. Helix angle 250 , pressure angle α = 200 stub

iv. Material for both pinion and gear is medium carbon steel whose allowable stress may be taken as 230 MPa

v. Pinion diameter is limited to 120 mm Determine the axial thrust on the shaft and check the gears for dynamic and wear loads

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clc;

clear all;

Intalizing the given values:

P = 34

N\_p = 2800

z\_p = 18

i = 4.5

alpha = 20

beta = 25

d\_p = 120

S\_p = 230

S\_g = S\_p

S\_es = 618

Finding the gear diameter and the teeth on gear:

d\_g = i\*d\_p

z\_g = i\*z\_p

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

Finding the strength factor deciding on if the design is based on pinion or 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\_g,SF\_p)

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)

Finding the axial thrust on the shaft:

Fa = Ft\*tand(beta)

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

Y = pi\*y;

syms b m\_n

Assuming k = 15 and Cw =1.5 reffering to table 12.21 wear and lubrication factor:

k = b/m\_n

k = 15

Cw = 1.15

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

e = Table\_12\_14(v)

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

Finding the face width and verifying its under permissible limits for safety:

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:

K3 = 20.67

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

Finding the limiting load for wear and verfying if its in permissible limits:

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