Program for Design of Spur Gear, Problem 2.

Problem Statement: A pair of spur gears has to transit 20 kW from a shaft rotating at 1,000 rpm to a parallel shaft which is to rotate at 310 rpm. Number of teeth on pinion is 31 with 20 degree full depth involute tooth form. The material for pinion is steel SAE 1040 untreated with allowable static stress 206.81 MPa and the material for the gear is cast steel 0.20% C untreated with allowable static stress 137.34 MPa. Determine the module and face width of the gear pair. Also find the dynamic tooth load on the gears. Take the service factor as 1.5.

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Name: Avva Sai Pranav

USN: PES1201800861

clc;

clear all;

Intializing the known data from the quesiton:

P = 20

N1 = 1000

N2 = 310

z1 = 31

alpha =20

S\_d1 = 206.81

S\_d2 = 137.34

Cs = 1.5

Finding the velocity ration and the number of teeth:

i = N1/N2

z2 = i\*z1

Finding the lewis form factor:

[y1]=Lewis(z2)

[y2]=Lewis(z2)

Find the strength factor, find the weaker part and deciding what the design is based on:

if S\_d1\*y1<S\_d2\*y2

disp("Design is based on pinion")

S\_d=S\_d1;

Y=pi\*y1;

z=z1;

else

disp("Design is based on gear")

S\_d=S\_d2;

Y=pi\*y2;

z=z2;

end

Trial 1:

Assuming m and standardizing it:

Mt = ((P\*60)/(2\*pi\*N2))\*10^3;

k = 10;

Cv = 5;

m = 3.4;

[m] = Tb12\_2\_1a(m)

Finding the PCD of pinion and gear respectively:

d1 = m\*z1

d2 = m\*z2

b = 10\*m

Finding the velocity and identifying the Cv value:

v = (pi\*d2\*N2)/(1000\*60)

if v<=8

Cv1 = 3.05/(3.05+v);

elseif v>8 && v<=13

Cv1 = 4.58/(4.58+v);

elseif v>13 && v<=20

Cv1 = 6.1/(6.1+v);

elseif v>20

Cv1 = 5.55/(5.55+sqrt(v));

end

Finding the tangential force:

Ft = (2\*Mt\*Cs\*1000)/(d2)

Verifying if the values found are satifactory:

S\_d22 = Ft/(pi\*Cv1\*b\*y2\*m\*10^3);

if S\_d22 >S\_d2

disp('Values are not satisfactory');

else

disp('Values are satisfactory');

end

As the values are satisfactory, no futher trials required.

Finding the dynamic load:

K3 = 20.67

e1 = Table\_12\_14(v)

e = 0.04

k1 =8.7;

C = 457.8

C = (C\*e1)/e

[Fd] = Eqn\_12\_12(Ft,K3,v,C,b);

Fd = Fd\*10^-3