**Appendix**

**Problem 2**

%Lawrence Custodio

%HW 4 Problem 2

clc; clear; close all;

load('phi.mat');

load('Y.mat');

%Given Parameters:

y = Y(:,1).\*1000; %displacement [mm]

theta = (0:360)'\*(pi/180); %cam angle [rad]

rbase = 35; %Radius of base circle [mm]

Rr = 10; %Radius of follower [mm]

Ro = rbase+Rr; %Radius of prime circle [mm]

%Part A:

%Pitch curve (black + dashed line)

xp = (Ro+y).\*sin(theta);

yp = (Ro+y).\*cos(theta);

plot(xp,yp,'k--');

hold on

%Cam contour (red + line width 3)

%Cam contact point rel. to pitch curve: xcp, ycp

xcp = Rr\*sin(theta-phi);

ycp = Rr\*cos(theta-phi);

%Cam contour defined as difference of pitch curve and contact point:

xc = xp -xcp;

yc = yp -ycp;

plot(xc,yc,'r','linewidth',3);

%Base circle (blue)

xbase = rbase.\*cos(theta);

ybase = rbase.\*sin(theta);

plot(xbase,ybase,'b')

%Plot labelling

axis equal

title ('Fig.1: Cam Design')

xlabel('x [mm]')

ylabel('y [mm]')

legend('Pitch curve','Cam Contour','Base Circle');

%Part C: Save CAM profile

xp(361)=0; %Reassure that last point = first point

sld = [xp yp zeros(361,1)]; %matrix for extracting pitch curve

save('Cam.txt','sld','-ASCII');

%Part B:

alpha = (0:30:330)\*pi/180; %Degrees of rotation;

%Matrix describing base circle + cam contour coordinates

base = [xbase';ybase';ones(1,length(xbase))]; %base circle

cont = [xc';yc';ones(1,length(xc))]; %cam contour

%rotation transformation matrices:

%First figure: 0-150 degrees

figure

for j=1:1:6

ccw = [cos(alpha(j)) -sin(alpha(j)) 0; sin(alpha(j)) cos(alpha(j)) 0; 0 0 1]; % Transformation Matrix

baset = ccw\*base; %Transformed matrix, base circle

camt = ccw\*cont; %Transformed matrix, cam contour

%Plotting + Labels

subplot(2,3,j)

plot(baset(1,:),baset(2,:))

hold on

plot(camt(1,:),camt(2,:),'r','linewidth',3)

xlabel('x [mm]')

ylabel('y [mm]')

grid on

axis equal

title(['\theta= ' num2str(alpha(j)\*(180/pi))])

end

%Second figure: 180-330 degrees

figure

for m=7:1:12

ccw = [cos(alpha(m)) -sin(alpha(m)) 0; sin(alpha(m)) cos(alpha(m)) 0; 0 0 1];

baset = ccw\*base;

camt = ccw\*cont;

subplot(2,3,(m-6))

plot(baset(1,:),baset(2,:))

hold on

plot(camt(1,:),camt(2,:),'r','linewidth',3)

xlabel('x [mm]')

ylabel('y [mm]')

grid on

axis equal

title(['\theta= ' num2str(alpha(m)\*(180/pi))])

end