

ME 1020 Engineering Programming with MATLAB

Problem 5.29:

29. A robot rotates about its base at 2 rpm while lowering its arm and extending its hand. It lowers its arm at the rate of 120° per minute and extends its hand at the rate of 5 m/min. The arm is 0.5 m long. The xyz coordinates of the hand are given by

$$x = (0.5 + 5t) \sin\left(\frac{2\pi}{3}t\right) \cos(4\pi t)$$

$$y = (0.5 + 5t) \sin\left(\frac{2\pi}{3}t\right) \sin(4\pi t)$$

$$z = (0.5 + 5t) \cos\left(\frac{2\pi}{3}t\right)$$

where t is time in minutes.

Obtain the three-dimensional plot of the path of the hand for $0 \leq t \leq 0.2$ min.

```
% Problem 5.29
clear
clc
disp('Problem 5.29: Scott Thomas')

N = 1000;
t = linspace(0,0.2,N);

x = (0.5 + 5*t).*sin(2*pi*t/3).*cos(4*pi*t);
y = (0.5 + 5*t).*sin(2*pi*t/3).*sin(4*pi*t);
z = (0.5 + 5*t).*cos(2*pi*t/3);

plot3(x,y,z),hold
plot3(x(1),y(1),z(1),'*',x(N),y(N),z(N),'o')
text(x(1)-0.1,y(1),z(1)+0.1,'Start'), text(x(N),y(N),z(N)-0.1,'End')
ylabel('y'), xlabel('x'), zlabel('z')
title('Problem 5.29: Scott Thomas')
grid on
```

Problem 5.29: Scott Thomas
Current plot held

