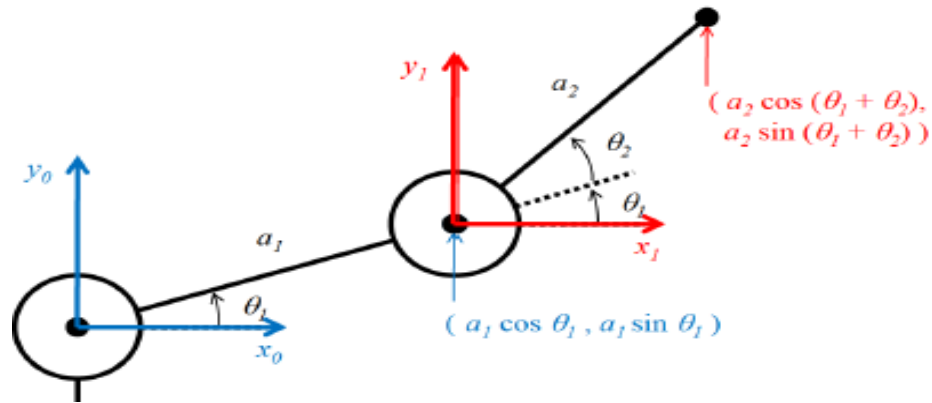


1. Please provide an equation that will provide allow us to calculate for (X, Y)

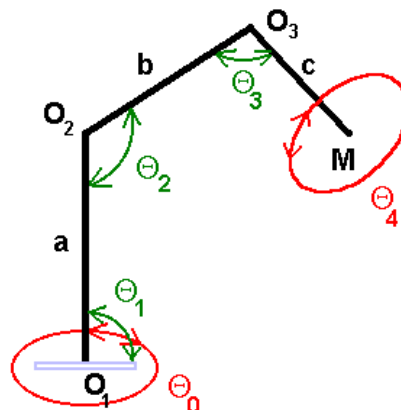


X= _____ **Y=** _____

2. Define the following:

- a. Slew Motion ,
- b. Joint Interpolated,
- c. Straight Line Interpolation,
- d. Circular interpolation,

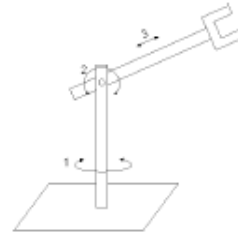
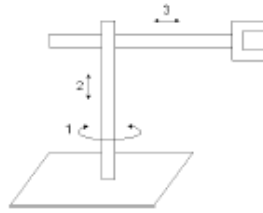
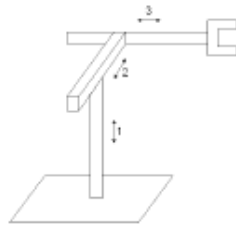
3. How many Degree of Freedom (DOFs) does this arm have? _____



Homework 2

1. Given the following please indicate the number of Revolute and number of Prismatic Joints. Write them under the graphic of the arm. Format is for example RPP or PPP, etc.

- Industrial Robot Geometries (Anatomies):



Answers: _____

2. List two advantages and two disadvantages for a cylindrical-coordinated robot arm:

a.

b.

Homework 3

Name _____ **DUE:**

1. List the 3 types of work part transport systems used in in-line robot work cells:

- 1.
- 2.
- 3.

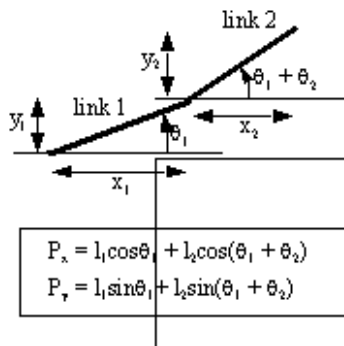
2. Define the following terms:

a. Robot-Centered work cell

b. In-Line robot work cell

c. Mobile work cell

1. Given the following two link revolute robot arm, lengths and angles please find point Px and Py (forward kinematics). L1 = 4, L2 = 5, angle1 = 35, angle2 is 40



$$P_x = x_1 + x_2$$

$$P_y = y_1 + y_2$$

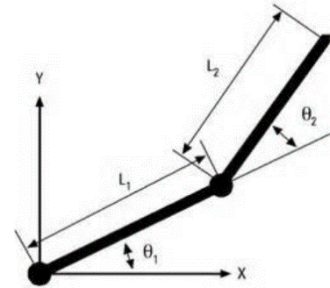
$$x_1 = L_1 \cos \theta_1$$

$$y_1 = L_1 \sin \theta_1$$

$$x_2 = L_2 \cos(\theta_1 + \theta_2)$$

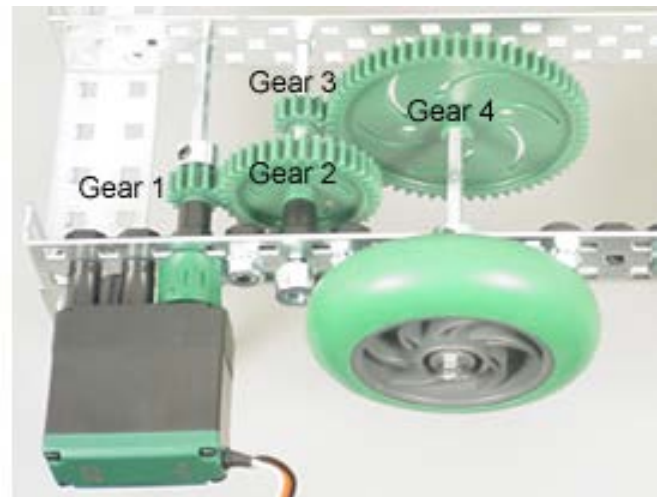
$$y_2 = L_2 \sin(\theta_1 + \theta_2)$$

$P_x = L_1 \cos \theta_1 + L_2 \cos(\theta_1 + \theta_2)$ $P_y = L_1 \sin \theta_1 + L_2 \sin(\theta_1 + \theta_2)$



2. Calculate the gear ratio: _____

Gear 1 = 12 teeth Gear 2 = 36 teeth
 Gear 3 = 12 teeth Gear 4 = 60 teeth



Homework 5

Name _____ DUE:

1. From the techniques used in computer vision please define the following:

a. **Middle Mass and Blob Detection:**

b. **Pixel Classification:**

c. **What is a Kalman Filter?**

2. What is the difference between an NPN and PNP sensor? Draw a diagram showing how you would wire each. Hint: remember sinking and sourcing – which one is which?

