

Code No: R05322402

R05**Set No. 2**

III B.Tech II Semester Examinations, December 2010

ROBOTICS

Automobile Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Consider the manipulator shown in figure 2a. Suppose the links and joints of the manipulator had the following settings: Length of the link $L_1=10.0\text{in}$, length of the extension link $L=15.0\text{in}$, length of link4, $L_4=3.0\text{in}$, Base angle $\theta=0^\circ$, Elevation angle $\Phi=20^\circ$, pitch angle $\varphi=34^\circ$. Determine the coordinates of the resulting point P at which the end-of-arm would be located. [8+8]

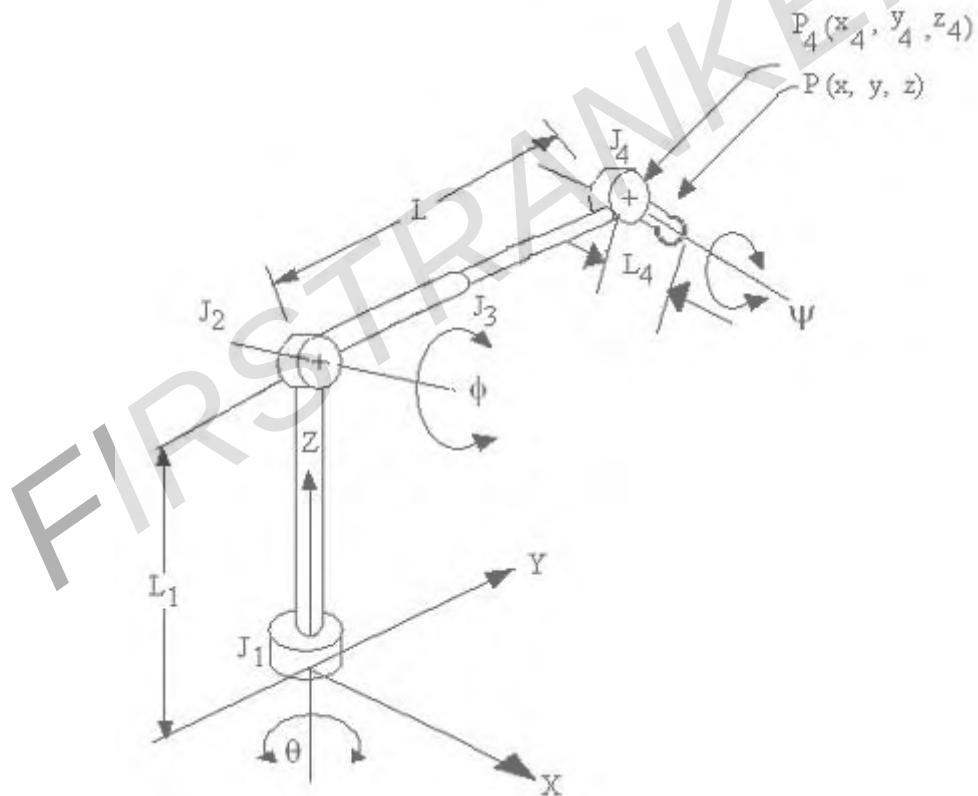


Figure 2a

- (b) In the above problem, determine the x,y, and z coordinates of joint 4.
2. Using Lagrange - Euler formulation, derive the expression for the joint Torques or forces of a planar PR Robotic manipulator. [16]
3. (a) Explain various methods of transmitting power and control signals to the end effectors.
- (b) Compare the electric, hydraulic and pneumatic types of locomotion devices. [7+9]

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4. (a) What are the features of Robots in Arc welding? Explain.
(b) What are the benefits of Robot spray painting? Explain. [8+8]
5. Determine the equations of polynomials for the three segments of a point - to - point trajectory between two points if a 3 - 5 - 3 trajectory plan is used. [16]
6. (a) Define the following terms in robotics:
i. work envelope
ii. work cell
iii. tip speed
iv. coordinated motion.
(b) Discuss the roles that the major and minor axes of a robot in positioning a part in space. [8+8]
7. **Write and explain the arm matrix of SCARA robot.** [16]
8. (a) Explain the working of voltage sensor.
(b) Find the output voltage of a potentiometer with the following characteristics. Also determine the voltage constant of the potentiometer. The excitation voltage is 36 V, the total wiper travel is 340° and the wiper position is 62° . [8+8]

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R05**Set No. 4**

III B.Tech II Semester Examinations, December 2010

ROBOTICS**Automobile Engineering****Time: 3 hours****Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Define the following terms in robotics:
 - i. work envelope
 - ii. work cell
 - iii. tip speed
 - iv. coordinated motion.(b) Discuss the roles that the major and minor axes of a robot in positioning a part in space. [8+8]
2. Using Lagrange - Euler formulation, derive the expression for the joint Torques or forces of a planar PR Robotic manipulator. [16]
3. Write and explain the arm matrix of SCARA robot. [16]
4. (a) What are the features of Robots in Arc welding? Explain.
(b) What are the benefits of Robot spray painting? Explain. [8+8]
5. (a) Explain various methods of transmitting power and control signals to the end effectors.
(b) Compare the electric, hydraulic and pneumatic types of locomotion devices. [7+9]
6. (a) Explain the working of voltage sensor.
(b) Find the output voltage of a potentiometer with the following characteristics. Also determine the voltage constant of the potentiometer. The excitation voltage is 36 V, the total wiper travel is 340° and the wiper position is 62°. [8+8]

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R05**Set No. 4**

7. Determine the equations of polynomials for the three segments of a point - to - point trajectory between two points if a 3 - 5 - 3 trajectory plan is used. [16]
8. (a) Consider the manipulator shown in figure 2a. Suppose the links and joints of the manipulator had the following settings: Length of the link $L_1=10.0\text{in}$, length of the extension link $L=15.0\text{in}$, length of link4, $L_4=3.0\text{in}$, Base angle $\theta=0^\circ$, Elevation angle $\Phi=20^\circ$, pitch angle $\varphi=34^\circ$. Determine the coordinates of the resulting point P at which the end-of-arm would be located. [8+8]

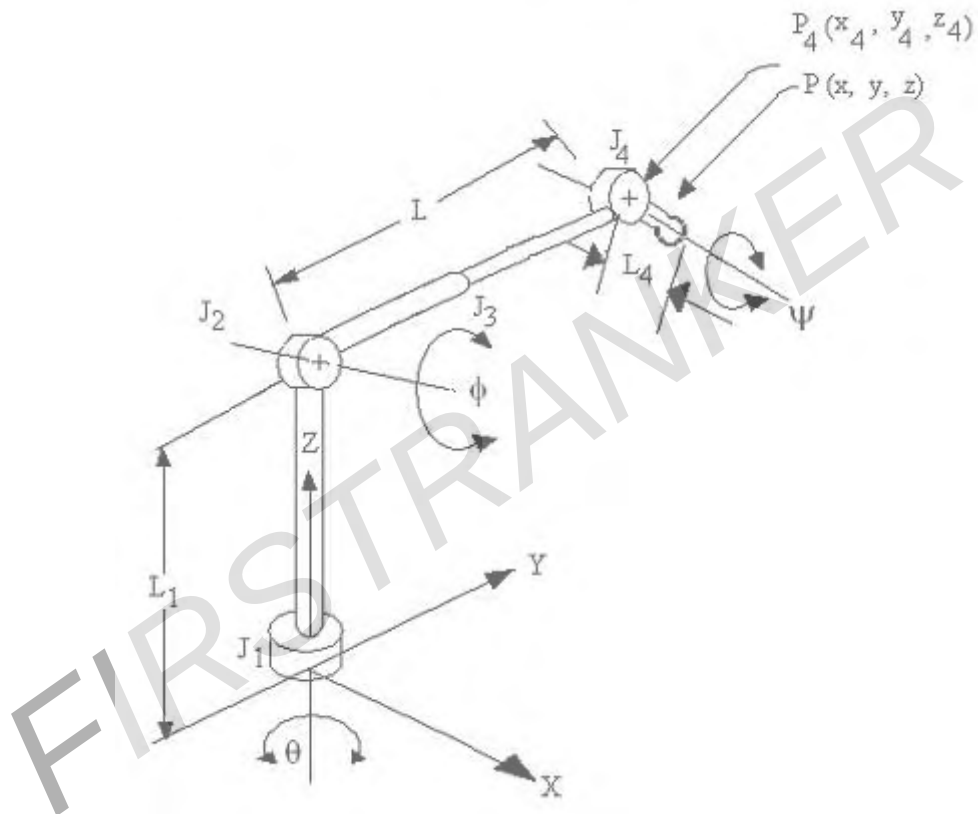


Figure 2a

- (b) In the above problem, determine the x,y, and z coordinates of joint 4.

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R05**Set No. 1**

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ROBOTICS

Automobile Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Consider the manipulator shown in figure 2a. Suppose the links and joints of the manipulator had the following settings: Length of the link $L_1=10.0\text{in}$, length of the extension link $L=15.0\text{in}$, length of link4, $L_4=3.0\text{in}$, Base angle $\theta=0^\circ$, Elevation angle $\Phi=20^\circ$, pitch angle $\varphi=34^\circ$. Determine the coordinates of the resulting point P at which the end-of-arm would be located. [8+8]

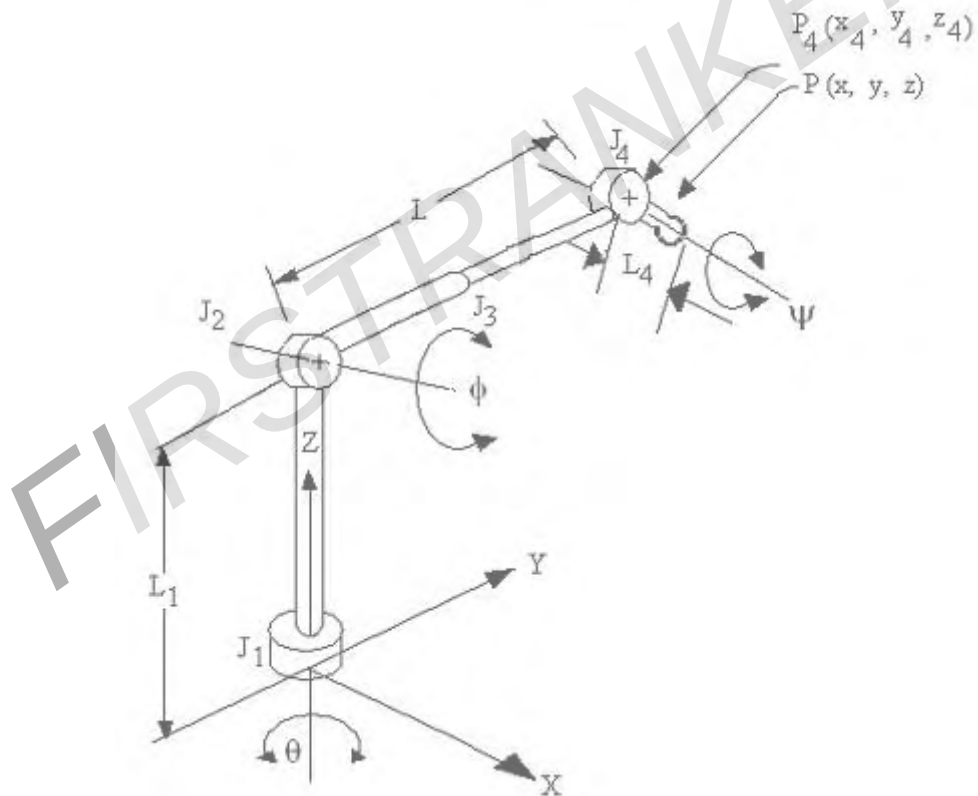


Figure 2a

- (b) In the above problem, determine the x,y, and z coordinates of joint 4.
2. Write and explain the arm matrix of SCARA robot. [16]

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R05**Set No. 1**

3. Using Lagrange - Euler formulation, derive the expression for the joint Torques or forces of a planar PR Robotic manipulator. [16]
4. Determine the equations of polynomials for the three segments of a point - to - point trajectory between two points if a 3 - 5 - 3 trajectory plan is used. [16]
5. (a) Explain various methods of transmitting power and control signals to the end effectors.
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 - i. work envelope
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8. (a) Explain the working of voltage sensor.
(b) Find the output voltage of a potentiometer with the following characteristics. Also determine the voltage constant of the potentiometer. The excitation voltage is 36 V, the total wiper travel is 340° and the wiper position is 62° . [8+8]

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R05**Set No. 3**

III B.Tech II Semester Examinations, December 2010

ROBOTICS

Automobile Engineering

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

- What are the features of Robots in Arc welding? Explain.
 - What are the benefits of Robot spray painting? Explain. [8+8]
- Consider the manipulator shown in figure 2a. Suppose the links and joints of the manipulator had the following settings: Length of the link $L_1=10.0\text{in}$, length of the extension link $L=15.0\text{in}$, length of link4, $L_4=3.0\text{in}$, Base angle $\theta=0^\circ$, Elevation angle $\Phi=20^\circ$, pitch angle $\varphi=34^\circ$. Determine the coordinates of the resulting point P at which the end-of-arm would be located. [8+8]

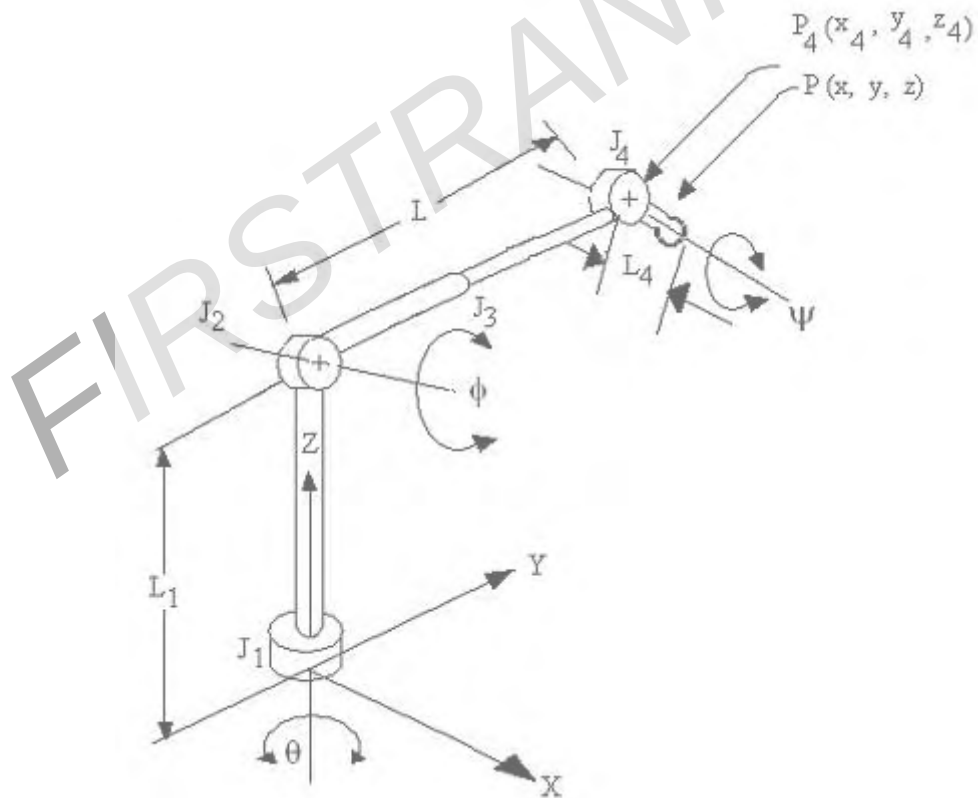


Figure 2a

- In the above problem, determine the x,y, and z coordinates of joint 4.
- Determine the equations of polynomials for the three segments of a point - to - point trajectory between two points if a 3 - 5 - 3 trajectory plan is used. [16]
 - Define the following terms in robotics:
 - work envelope

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R05**Set No. 3**

- ii. work cell
 - iii. tip speed
 - iv. coordinated motion.
- (b) Discuss the roles that the major and minor axes of a robot in positioning a part in space. [8+8]
5. Write and explain the arm matrix of SCARA robot. [16]
6. (a) Explain various methods of transmitting power and control signals to the end effectors.
- (b) Compare the electric, hydraulic and pneumatic types of locomotion devices. [7+9]
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