

Intelligent Manufacturing – Exam Questions about Robotics

IK= inverse kinematics / FK= forward kinematics

Robot Theme 1: Describing the robot cell (Frames and IK)

- Describe the layout of the robot cell that you have proposed in the miniproject?
- What standard frames are often defined in a robot cell?
- Which frames have you been using in your project and where are they located in your robot cell?
- Describe the workspace of the robot in relation to the layout of the robot cell.
- What is IK and when do you use it in your mini project?
- What happens to the number of IK solutions if you specify a goal outside of the workspace of the robot?
- Are there any, one or multiple solutions to the inverse kinematics, why/ why not?

Robot Theme 2: Describing the robot (Robot characteristics and FK)

- Describe the choice of robot in the mini project? E.g. degrees of freedom, accuracy and repeatability, payload, reach
- When do you use FK in your system?
- How does FK describe your robot?
- How are FK derived?
- Describe the Denavit-Hartenberg notation.

Robot Theme 3: Describing objects in the robot cell (Representation of Position and orientation)

- Describe the layout of the robot cell that you have proposed in the miniproject?
- Which frames have you been using in your project and where are they located in your robot cell?
- How are locations often represented?
- What does the elements in a transformation matrix mean?
- Describe the concept of
 - Euler angles
 - Quaternions
- Describe the difference between joint space and Cartesian space and how IK and FK relates them.

Robot Theme 4: Moving the robot in your robot cell (IK, robot programming)

- Describe the choice of robot in the mini project? E.g. degrees of freedom, accuracy and repeatability, payload, reach
- What is IK?

- What approaches are there to solving the equations?
- Are there any, one or multiple solutions to the IK, why/ why not?
- How would you program the robot to move from one position to another?
- How are robots programmed?
- What is the content of a robot program?
- What is on-line programming?
- What is off-line programming?

Robot Theme 5: Programming a robot (Robot programming and trajectory planning)

- Describe the choice of robot in the mini project? E.g. degrees of freedom, accuracy and repeatability, payload,
- How are robots programmed?
- What is the content of a robot program?
- What is on-line programming?
- What is off-line programming?
- What is a trajectory?
- How do you plan a trajectory?
- What requirements do we have to the trajectory?
- Describe cubic polynomials.
- Describe other methods.