ASC/N8353: Industrial Robotic System Planning

Description

This NOS unit is about performing tasks related to planning of selection, setup and installation of robots and end-effector.

Scope

The scope covers the following:

- Robot selection
- Planning for EOAT and safety mechanism.

Elements and Performance Criteria

Robot Selection

To be competent, the user/individual on the job must be able to:

PC1. define the specific task or tasks that need to be automated along with industry type. Understand the objectives, goals, and performance requirements of the automation project.

PC2. choose the type of robot that best suits the application. Common types include articulated robots, SCARA robots, delta robots, and cartesian robots. Consider factors like the range of motion and the complexity of the task.

PC3. analyse and determine no of axis required in the robot to complete the objective

PC4. analyze the physical characteristics of the workpiece(s) to be handled or processed, including size, shape, weight, and material. This information is essential for selecting an appropriate robot.

PC5. calculate the payload capacity and reach (working envelope) required for the robot to perform the task effectively. Consider not only the weight of the workpiece but also any additional loads such as tooling or sensors.

PC6. determine the desired cycle time and speed for the automation process. This helps in selecting a robot with the necessary speed and acceleration capabilities.

PC7. assess the level of precision and repeatability needed for the application. Some tasks may require high levels of accuracy, while others may tolerate lower precision.

PC8. take into account the environmental conditions in which the robot will operate, including temperature, humidity, dust, and any potential exposure to chemicals or contaminants. Ensure that the selected robot and EOAT can withstand these conditions.

PC9. identify safety requirements and standards that apply to the automation task. Ensure that the chosen robot comply with safety regulations and can be integrated into the existing safety system.

Planning for EOAT and safety mechanism

PC10. clearly define the objectives of the automation process and identify specific tasks, operations EOAT will perform.

PC11. determine the type of EOAT on the basis of size, shape, weight and material of the workpiece. Also consider the variation in geometry and material of workpieces.

PC12. determine how the EOAT should grip, manipulate, or handle the workpieces, considering factors like orientation, stacking, delicate handling and level of precision required.

PC13. determine the type of EOAT options include Grippers (Vacuum, magnetic, mechanical) , suction cups, specialized tools, and custom-designed attachments. Choose the one that can securely and efficiently handle the workpiece.

PC14. select material of EOAT which is compatible with workpiece after evaluating durability, wear resistance, temperature, humidity, dust and chemical compatibility. Ensure that the selected EOAT can withstand these conditions.

PC15. ensure that the selected EOAT and robot are compatible with each other in terms of mounting and communication interfaces. Verify that EOAT can be integrated into the automation system seamlessly.

PC16. identify potential hazards and risks associated with robot's operation and interaction with human operators and other equipment and familiarizing with relevant safety regulations and standards in industry for robotic systems.

PC17. clearly define safety goals and objectives. On the basis of potential hazard, risk assessment and safety objectives identify and select appropriate safety measures. Choose safeguarding device appropriate for the robotic cell i.e. safety fences and barriers, safety mats, light curtains, photo sensors, area scanners, safety laser scanners.

PC18. ensure compatibility of robot with safety interlocks to ensure that the robot stops if certain condition is not met, and include an emergency stop system that allows operators to quickly and easily halt the robot's motion in case of an emergency.

PC19. maintained detailed documents of robot, EOAT, robotic cell components and safety measures implemented in the robotic cell. Prepare a bill of materials for complete robotic cell.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. organisation procedures for health, safety and security, individual role and responsibilities in this context

KU2. safety standards and parameters need to follow during work

KU3. current market trend compared to conventional activity

KU4. application areas of Robotics and Automation

KU5. evolution of Robot history in the industry

KU6. objective of Robotic Automation for uninterrupted man less production

KU7. safe operation of electronic equipment like computers and printers

KU8. robot anatomy and Robot applications

KU9. selection criteria of robot

KU10. EOAT anatomy and pneumatic systems

KU11. End of arm Tooling (EOAT) design and its various types

KU12. pay load requirements, reachability requirements and accuracy requirements

KU13. criteria and parameters for the selection of robot, EOAT and other accessories needed

KU14. procedure of designing and layouting of robotic cell and its positions

KU15. effective layout making with proper man and material movement

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow instructions, guidelines, procedures, rules, and service level agreements

GS2. listen effectively and communicate information accurately

GS3. follow rule-based decision-making processes

GS4. make decisions on suitable courses

GS5. plan and organize the work to achieve targets and meet deadlines

GS6. apply problem-solving approaches to different situations

GS7. analyse the business impact and disseminate relevant information to others

GS8. apply balanced judgments to different situations

GS9. check the work is complete and free from errors

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Robot selection	**17**	**21**		**11**
PC1. clearly define the specific task or tasks that need to be automated along with industry type. Understand the objectives, goals, and performance requirements of the automation project.	2	1		1
PC2. choose the type of robot that best suits the application. Common types include articulated robots, SCARA robots, delta robots, and cartesian robots. Consider factors like the range of motion and the complexity of the task.	2	2		1
PC3. analyse and determine no of axis required in the robot to complete the objective	2	2		2
PC4. analyze the physical characteristics of the workpiece(s) to be handled or processed, including size, shape, weight, and material. This information is essential for selecting an appropriate robot.	2	3		1
PC5. calculate the payload capacity and reach (working envelope) required for the robot to perform the task effectively. Consider not only the weight of the workpiece but also any additional loads such as tooling or sensors.	3	3		2
PC6. determine the desired cycle time and speed for the automation process. This helps in selecting a robot with the necessary speed and acceleration capabilities.	2	3		1
PC7. assess the level of precision and repeatability needed for the application. Some tasks may require high levels of accuracy, while others may tolerate lower precision.	1	3		1
PC8. take into account the environmental conditions in which the robot will operate, including temperature, humidity, dust, and any potential exposure to chemicals or contaminants. Ensure that the selected robot and EOAT can withstand these conditions.	2	2		1
PC9. identify safety requirements and standards that apply to the automation task. Ensure that the chosen robot comply with safety regulations and can be integrated into the existing safety system.	1	2		1

Planning for EOAT and safety mechanism	**13**	**29**		**9**
PC10. clearly define the objectives of the automation process and identify specific tasks, operations EOAT will perform.	1	2		1
PC11. determine the type of EOAT on the basis of size, shape, weight and material of the workpiece. Also consider the variation in geometry and material of workpieces.	2	4		1
PC12. determine how the EOAT should grip, manipulate, or handle the workpieces, considering factors like orientation, stacking, delicate handling and level of precision required.	2	4		1
PC13. determine the type of EOAT options include Grippers (Vacuum, magnetic, mechanical) , suction cups, specialized tools, and custom-designed attachments. Choose the one that can securely and efficiently handle the workpiece.	1	3		1
PC14. select material of EOAT which is compatible with workpiece after evaluating durability, wear resistance, temperature, humidity, dust and chemical compatibility. Ensure that the selected EOAT can withstand these conditions.	1	2		1
PC15. ensure that the selected EOAT and robot are compatible with each other in terms of mounting and communication interfaces. Verify that EOAT can be integrated into the automation system seamlessly.	2	4		1
PC16. identify potential hazards and risks associated with robot's operation and interaction with human operators and other equipment and familiarizing with relevant safety regulations and standards in industry for robotic systems.	1	3		1
PC17. clearly define safety goals and objectives. On the basis of potential hazard, risk assessment and safety objectives identify and select appropriate safety measures. Choose safeguarding device appropriate for the robotic cell i.e. safety fences and barriers, safety mats, light curtains, photo sensors, area scanners, safety laser scanners.	1	3		1
PC18. ensure compatibility of robot with safety interlocks to ensure that the robot stops if certain condition is not met, and include an emergency stop system that allows operators to quickly and easily halt the robot's motion in case of an emergency.	1	2		

PC19. maintained detailed documents of robot, EOAT, robotic cell components and safety measures implemented in the robotic cell. Prepare a bill of materials for complete robotic cell.	1	2		1
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N8353
NOS Name	Industrial Robotic System Planning
Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Automotive Product Development
NSQF Level	5.5
Credits	2
Version	1.0
Last Reviewed Date	29/09/2023
Next Review Date	29/09/2026
NSQC Clearance Date	29/09/2023