



BRAINWARE UNIVERSITY

Term End Examination 2025-2026

Programme – B.Tech.(CSE)-AIML-2021/B.Tech.(CSE)-DS-2021/B.Tech.(CSE)-DS-2022

Course Name – Electronic Design Automation

Course Code - OEC-CSM801A/OEC-CSD801A

(Semester VIII)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) Choose the type of industrial robot that is best suited for high-speed pick-and-place operations.
 - a) SCARA
 - b) Delta
 - c) Articulated
 - d) Cartesian
- (ii) Choose the type of industrial robot that has a fixed base and a robotic arm for material handling.
 - a) Cartesian
 - b) SCARA
 - c) Delta
 - d) Cylindrical
- (iii) Choose the primary advantage of using articulated robots in industrial applications.
 - a) Higher precision
 - b) Faster speed
 - c) Higher flexibility
 - d) Lower cost
- (iv) Cite the primary advantage of using robots in continuous arc welding.
 - a) Consistent weld quality
 - b) Reduced operator fatigue
 - c) Faster operation
 - d) Lower operational cost
- (v) Identify the main challenge in robotic continuous arc welding.
 - a) Heat distortion
 - b) Joint misalignment
 - c) Inconsistent penetration
 - d) Poor arc stability
- (vi) Cite the type of sensors commonly used in robotic arc welding.
 - a) Laser sensors
 - b) Ultrasonic sensors
 - c) Vision sensors
 - d) Infrared sensors
- (vii) Cite the main benefit of robotic spray painting in the aerospace industry.
 - a) Better surface finish
 - b) Reduced material usage
 - c) Increased durability
 - d) Enhanced environmental compliance
- (viii) Identify the primary challenge in robotic spray painting.
 - a) Paint overspray
 - b) Complex programming

- c) Inaccurate spray patterns
 - d) Difficult maintenance
 - (ix) Cite the main reason for integrating machine vision in robotic spray painting.
 - a) Enhanced defect detection
 - b) Improved process control
 - c) Automated quality assurance
 - d) Optimized paint usage
 - (x) Select the most important factor when choosing a robot for an industrial application.
 - a) Payload capacity
 - b) Work envelope
 - c) Speed
 - d) Cost
 - (xi) Identify the key performance metric of a robot in precision tasks.
 - a) Resolution
 - b) Repeatability
 - c) Hysteresis
 - d) Torque
 - (xii) Select the primary factor influencing the selection of a robot for heavy lifting applications.
 - a) Actuator type
 - b) Torque requirement
 - c) Power supply
 - d) Sensor accuracy
 - (xiii) Describe the primary function of a robotic gripper in automation.
 - a) To grasp, hold, and manipulate objects
 - b) To increase the speed of conveyors
 - c) To replace robotic arms
 - d) To decrease the efficiency of handling
 - (xiv) Identify a key factor in gripper force analysis.
 - a) Contact force between gripper and object
 - b) The weight of the robot
 - c) The speed of the conveyor
 - d) The length of the robotic arm
 - (xv) Select one advantage of passive grippers.
 - a) They require no external power
 - b) They have complex control mechanisms
 - c) They are expensive to maintain
 - d) They operate using electrical inputs

Group-B

(Short Answer Type Questions)

$$3 \times 5 = 15$$

2. Apply the concept of industrial robots in modern manufacturing processes. (3)
3. Apply the principles of robotic vision systems in industrial automation. (3)
4. Apply a sensor integration strategy to improve the accuracy of a robot's continuous arc welding path. (3)
5. Explain the significance of gripper force analysis in robotic systems. (3)
6. Differentiate the stress distribution patterns between robotic spot welding on thin versus thick metal sheets. (3)

OR

Compare the efficiency of using different spray nozzle types in a robotic spray painting system (3) for achieving uniform coating on complex surfaces.

Group-C

(Long Answer Type Questions)

$$5 \times 6 = 30$$

7. Describe the key differences between articulated and Cartesian robots. (5)
8. Discuss the common techniques used for object recognition. (5)
9. Evaluate the strategies for integrating diverse industrial robot types within a smart manufacturing environment to maximize both operational efficiency and production flexibility. (5)
10. Estimate the gripping force required to hold an object of a given weight. (5)
11. Analyze the impact of real-time sensor feedback on the dynamic adjustments of a robotic continuous arc welding system when dealing with variations in material thickness and joint preparation. (5)
12. Evaluate the key considerations in designing a material handling system for a manufacturing plant. (5)

OR

Measure the effectiveness of Automated Guided Vehicle (AGV) systems compared to traditional conveyor systems.

(5)

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