



## BRAINWARE UNIVERSITY

Term End Examination 2023-2024

Programme – B.Tech.(RA)-2021

Course Name – Industrial Robotics and Automation

Course Code - PCC-ECR602

( Semester VI )

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) Identify from the following that is NOT a common image representation format used in robotic vision systems.
- |        |         |
|--------|---------|
| a) BMP | b) JPEG |
| c) PNG | d) MP4  |
- (ii) Select the primary goal of material handling.
- |                                     |                                   |
|-------------------------------------|-----------------------------------|
| a) Maximizing warehouse space       | b) Minimizing labor costs         |
| c) Improving operational efficiency | d) Reducing equipment maintenance |
- (iii) Choose Industrial trucks that are commonly used for which type of material handling.
- |                            |                           |
|----------------------------|---------------------------|
| a) Long-distance transport | b) High-speed conveyance  |
| c) Small part picking      | d) Bulk material movement |
- (iv) Choose advantages of Radio Frequency Identification (RFID) technology.
- |                                   |  |
|-----------------------------------|--|
| a) Limited data storage capacity  | b) Line-of-sight scanning requirements |
| c) Enhanced security and accuracy | d) Low initial investment costs        |
- (v) Choose the technology that enables automated material handling equipment to communicate with each other and with central systems.
- |         |             |
|---------|-------------|
| a) ASRS | b) RFID     |
| c) AGV  | d) Bar code |
- (vi) Identify the aim of Material handling systems
- |                          |                       |
|--------------------------|-----------------------|
| a) Equipment utilization | b) Labor productivity |
| c) Inventory accuracy    | d) Cycle times        |
- (vii) Identify a common challenge in conventional material handling systems.
- |                              |                                    |
|------------------------------|------------------------------------|
| a) Limited energy efficiency | b) Incompatibility with automation |
| c) Low reliability           | d) Insufficient load capacity      |
- (viii) Name a system that is best suited for high-speed, continuous material flow.
- |                      |                      |
|----------------------|----------------------|
| a) Conveyor systems  | b) Industrial trucks |
| c) Cranes and hoists | d) Monorails         |

- (ix) Choose the key advantage of using monorails in material handling systems.
- |                          |                                     |
|--------------------------|-------------------------------------|
| a) Limited load capacity | b) Flexibility in route planning    |
| c) High-speed transport  | d) Complex maintenance requirements |
- (x) Choose a technology that is used for real-time tracking of inventory within a warehouse.
- |                |             |
|----------------|-------------|
| a) AGV systems | b) RFID     |
| c) ASRS        | d) Bar code |
- (xi) Select the type of gripper that is typically used for delicate objects?
- |                      |                      |
|----------------------|----------------------|
| a) Pneumatic gripper | b) Hydraulic gripper |
| c) Magnetic gripper  | d) Vacuum gripper    |
- (xii) Choose the type of gripper that requires an external power source to operate?
- |                      |                      |
|----------------------|----------------------|
| a) Passive gripper   | b) Active gripper    |
| c) Pneumatic gripper | d) Hydraulic gripper |
- (xiii) Select a key advantage of passive grippers.
- |                         |                            |
|-------------------------|----------------------------|
| a) High precision       | b) Minimal maintenance     |
| c) Greater force output | d) Variable gripping modes |
- (xiv) Identify image format that is commonly used for lossless compression and supports transparency.
- |         |        |
|---------|--------|
| a) JPEG | b) BMP |
| c) PNG  | d) GIF |
- (xv) Select from the following that is a lossy compression technique commonly used in image data compression.
- |         |        |
|---------|--------|
| a) JPEG | b) PNG |
| c) BMP  | d) GIF |

**Group-B**

(Short Answer Type Questions)

3 x 5=15

2. Explain the role that software testing plays in robot performance evaluation. (3)
3. Write crucial factors in material handling tasks. (3)
4. Discuss the role that data analysis and performance monitoring play in optimizing robot performance. (3)
5. Describe the importance of material handling in industrial operations. (3)
6. Explain the impact of external forces, such as gravity and inertial forces on gripper force analysis. (3)

**OR**

- Analyse the design of grippers with multiple degrees of freedom to enhance manipulation capabilities. co4/3/k4 (3)

**Group-C**

(Long Answer Type Questions)

5 x 6=30

7. Explain the impact of advancements in materials science and additive manufacturing technologies on gripper design and performance. (5)
8. Explain the general considerations in robotic material handling to ensure efficiency and safety in industrial settings. (5)
9. Discuss the role of radio frequency identification (RFID) technology in material handling systems and its advantages over barcode technology. (5)
10. Illustrate how robots contribute to cleaning tasks in industrial settings, and what efficiencies they bring. (5)
11. Explain how robotic vision systems handle challenges such as occlusions, varying object orientations, and complex environments during object recognition. (5)
12. Focus role that does scalability and future-proofing play in the economic rationale for robotization. (5)

**OR**

Explain that robots contribute to productivity gains and operational efficiencies in industries. (5)

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