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BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – B.Tech.(CSE)-AIR-2024
Course Name – Robot Operating Systems
Course Code - BTR40105
(Semester IV)

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 the primary goal of robotics.
 - a) Replace humans
 - b) Automate tasks
 - c) Develop AI
 - d) Build computers
- (ii) Identify a robot.
 - a) Manual machine
 - b) Programmable electromechanical system
 - c) Software tool
 - d) Database
- (iii) Identify one application of robotics.
 - a) Agriculture
 - b) Accounting
 - c) Literature
 - d) Law
- (iv) Identify a major challenge in robotics.
 - a) Sensor uncertainty
 - b) Perfect control
 - c) Unlimited power
 - d) No errors
- (v) Select the correct expansion of ROS.
 - a) Robot Open Software
 - b) Robotic Operating System
 - c) Robot Operating System
 - d) Real-time OS
- (vi) Apply ROS concepts to select the correct mechanism for continuous sensor data streaming.
 - a) Service
 - b) Topic
 - c) Parameter
 - d) Action
- (vii) Apply the publisher–subscriber model to identify the sender of data.
 - a) Subscriber
 - b) Publisher
 - c) Master
 - d) Parameter Server
- (viii) Apply ROS architecture to determine where nodes register for communication.
 - a) Workspace
 - b) ROS Master

- c) Topic d) Package
- (ix) Apply simulation concepts to select the correct tool for physics-based testing.
- a) RViz b) RQT
- c) Gazebo d) ROS Master
- (x) Apply ROS tools knowledge to debug node communication.
- a) Gazebo b) RViz
- c) RQT d) Parameter Server
- (xi) Apply ROS integration strategies to support multi-language nodes.
- a) Hardcoding b) Standard ROS APIs
- c) Direct memory sharing d) Manual messaging
- (xii) Apply ROS debugging to identify runtime errors.
- a) Ignore warnings b) Use rosconsole logs
- c) Delete workspace d) Reinstall OS
- (xiii) Apply ROS testing methods to isolate faulty nodes.
- a) Disable all nodes b) Unit testing with rostest
- c) Change hardware d) Avoid simulation
- (xiv) Apply ROS integration concepts to connect external middleware.
- a) ROS Bridge b) RViz
- c) RQT d) Gazebo
- (xv) Apply ROS concepts to select a tool for hardware abstraction.
- a) ROS control b) RViz
- c) Gazebo d) RQT

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Define robotics and state its primary objective. (3)
3. Apply ROS debugging concepts to explain how RQT helps developers. (3)
4. Apply ROS software practices to explain how modularity improves development. (3)
5. Explain the role of ROS interfaces and plugins in enabling Gazebo-ROS integration. (3)
6. Evaluate the effectiveness of SLAM for indoor navigation. (3)

OR

Evaluate the need for security mechanisms in ROS communication. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. Describe the ROS architecture with its main components. (5)
8. Apply simulation concepts to explain how Gazebo is used to test navigation algorithms. (5)
9. Apply ROS package development guidelines to explain how dependencies are managed in a ROS project. (5)
10. Analyze the importance of costmaps in ROS-based navigation. (5)
11. Evaluate the advantages of using ROS navigation stack over custom navigation solutions. (5)
12. Analyze the challenges of integrating ROS with heterogeneous hardware platforms. (5)

OR

Analyze the impact of programming language choice on ROS system performance. (5)
