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BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – B.Tech.(CSE)-DS-2022
Course Name – Robotics and its Applications
Course Code - OEC-CSD701A
(Semester VII)

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 core function of a robot's actuator.
a) Generate commands b) Move joints
c) Store data d) Transfer signals

(ii) Recall the purpose of a sensor in a robotic system.
a) Store code b) Sense environment
c) Transmit sound d) Secure components

(iii) Choose the purpose of robot specifications.
a) To decorate manuals b) To define capabilities
c) To increase cost d) To shorten lifespan

(iv) Identify the component responsible for robot control logic.
a) Gripper b) Controller
c) Leg d) Power supply

(v) Select a commonly used manipulator type.
a) Spherical b) Plastic
c) Optical d) Thermal

(vi) Choose the term for robot programming by demonstration.
a) Supervised learning b) Manual override
c) Teach pendant d) Voice coding

(vii) Identify the mathematical method used in forward kinematics.
a) Euler's Law b) Homogeneous transformation
c) Laplace transform d) Kalman filter

(viii) Select the robot configuration often used for pick-and-place.
a) SCARA b) Drone
c) Walker d) Delta

(ix) Recall the number of transformation parameters in DH convention.
a) 2 b) 3

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c) 4 d) 5

(x) Select the correct type of joint in a revolute pair.

a) Prismatic b) Linear
c) Rotational d) Sliding

(xi) Describe a key challenge in inverse kinematics.

a) Noise b) Multiplicity of solutions
c) Low weight d) Voltage spike

(xii) Select the property that defines robot reachability.

a) Weight b) Degrees of freedom
c) Battery life d) Texture

(xiii) Identify the purpose of coordinate transformations in robotics.

a) Color change b) Sound amplification
c) Frame conversion d) Voltage gain

(xiv) Interpret why multiple solutions exist in inverse kinematics.

a) Redundancy b) Inaccuracy
c) Heat loss d) Bandwidth use

(xv) Select the best condition for circular path planning.

a) Long joints b) Angular motions
c) End-effector curvature d) Short cables

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Describe a robot in industrial context. (3)
3. Explain how robots are classified based on their mobility. (3)
4. Apply joint space trajectory planning to generate motion for a 2-DOF robot arm. (3)
5. Apply different control modes used in surgical robotics. (3)
6. Analyze the differences between joint space and Cartesian space trajectory planning. (3)

OR

Analyze how parametric descriptions simplify trajectory planning in robotics. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Define the concept of homogeneous transformation and explain its role in robotic kinematics. (5)
8. Create a step-by-step direct kinematics model for a two-joint planar robot. (5)
9. Compare the advantages and limitations of joint space and Cartesian space path planning. (5)
10. Classify medical robots based on their application domains such as navigation, imaging, and rehabilitation. (5)
11. Compare traditional surgical methods with robotic-assisted surgeries in terms of accuracy and patient recovery. (5)
12. Justify the use of PID control in industrial robotic systems by analyzing its advantages. (5)

OR

Justify the use of robotic imaging in enhancing the precision of urologic surgery. (5)

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