BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – M.Tech.(RA)-2024
Course Name – Robotic Engineering
Course Code - MEC10101
(Semester I)

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) Indicate the father of robotics.
a) Isaac Asimov b) George Devol
c) Nikola Tesla d) Alan Turing

(ii) Choose the primary purpose of a end effector.
a) To provide power b) To manipulate objects
c) To control movement d) To sense the environment

(iii) Choose from the following that is an example of a gripper type.
a) Vacuum gripper b) Hydraulic gripper
c) Mechanical gripper d) All of the above

(iv) Infer the term actuation in robotics.
a) The movement of robots b) The energy source
c) The programming of robots d) The sensing of environment

(v) Choose the term that is used for the movement of a rigid body in space.
a) Translation b) Rotation
c) Inversion. d) Scaling

(vi) Define from the following, the orientation of a rigid body.
a) Position vector b) Euler angles
c) Velocity vector d) Force vector

(vii) Choose the purpose of a prismatic joint in a robotic mechanism.
a) To allow linear motion b) To allow rotational motion
c) To sense the environment d) To connect links

(viii) Find from the following, the method often used for forward dynamics calculations.
a) Newton-Euler b) Jacobian matrix
c) Position-space mapping d) Denavit-Hartenberg

(ix) Select the primary goal of path planning in robotics.

a) To find the shortest path
b) To avoid obstacles and find a feasible path
c) To minimize joint angles
d) To maximize speed

(x) Choose from the following that is a common algorithm for path planning.

a) PID Controller
b) Dijkstra's Algorithm
c) Fourier Transform
d) Kalman Filter

(xi) In probabilistic path planning, indicate from the the following that is used to explore the environment.

a) Artificial neural networks
b) Rapidly-exploring random trees (RRT)
c) Simulated annealing
d) Fuzzy logic

(xii) Choose from the following sensors that is most commonly used for continuous trajectory recording in real-time.

a) Lidar
b) Gyroscope
c) Encoders
d) Ultrasonic sensors

(xiii) Select the primary goal of economic analysis in robotics.

a) To determine the technical feasibility of robots
b) To maximize human involvement in production
c) To evaluate the costs and benefits of robots
d) To minimize energy consumption

(xiv) Indicate from the following methods that is commonly used in economic analysis.

a) Net Present Value (NPV)
b) Fibonacci sequence
c) SWOT analysis
d) Moore's Law

(xv) Choose the reason of using robots in production.

a) They require constant supervision
b) They can work 24/7 without breaks
c) They increase the number of workers required
d) They are cheaper than all human labor

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Analyze the importance of universal hand systems in robotics. (3)

3. Explain the impact of singularities in control mechanisms of robotics. (3)

4. Describe the different types of Path Planning algorithms. (3)

5. Write the basic data requirements for Economic Analysis in Robotics. (3)

6. Explain servo controlled robotic system. (3)

OR

Explain the common types of arm geometry in robots. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Discuss the contribution of advanced sensors to robot navigation. (5)

8. Analyze how links and joints are represented in robotic systems. (5)

9. Describe controller and sensor of a robotic system. (5)

10. Illustrate the significance of velocity profiles in Trajectory Planning. (5)

11. Explain how optimization is used in Trajectory Planning. (5)

12. Analyze robotics to improve overall productivity. (5)

OR

Analyze the key considerations for maintenance in robotic systems. (5)

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