Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S,FE) Examination December 2025 (2019 Scheme)

Course Code: AIT304
Course Name: ROBOTICS AND INTELLIGENT SYSTEM

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks. Marks

1		Compare wheeled, legged, and aerial mobile robots	(3)
2		Briefly describe the Dynamic characteristics of Mobile robot	(3)
3		Compare CCD camera with CMOS Camera.	(3)
4		Differentiate between stepper motors and servo motors	(3)
5		Define the terms Steerability, and Manoeuvrability.	(3)
6		Define an omnidirectional wheeled mobile robot. How does its movement differ from a differential-drive robot?	(3)
7		Identify mobile robot localization problems.	(3)
8		Mention any three challenges faced in map representation.	(3)
9		What is the difference between breadth-first search and depth-first search in path planning?	(3)
10		Write a short note on the use of convolutional neural networks (CNNs) for robotic control.	(3)

PART B

Answer one question from each module, each carries 14 marks.

Module I

11	a)	Explain the anatomy of a robotic manipulator with a neat diagram.	(7)
	b)	What are the various types of end effectors used in robotics, and how are they selected based on task requirements?	(7)

OR

12	a)	Explain how degrees of freedom influence the complexity of tasks a robotic manipulator can perform, with examples.	(6)
	b)	Describe how PPP, RPP, RRP, and RRR robot configurations differ in structure and movement capabilities.	(8)

Module II

13 a) Discuss position and velocity sensors used in robotics. (8)

b) Describe the working of a PID (Proportional-Integral-Derivative) control system. (6)

OR

14 a) Describe the important characteristics of sensors used in robotics. (6)

b) Describe Pulse Width Modulation (PWM) and its role in actuator control. (8)

Module III

15 a) Explain the seven stages of robotic vision. (10)

b) Differentiate between holonomic and nonholonomic robots. (4)

OR

16 a) A point P (7, 3, 1) is attached to a frame and subjected to the following transformations. Find the coordinates of the point relative to the reference frame: (8)

1. Rotation of 90° about the z-axis
2. Followed by a rotation of 90° about the y-axis
3. Followed by a translation of [4, -3, 7]

b) Derive the kinematic model of a differential drive mobile robot. (6)

Module IV

17 a) Derive the error model for odometric position estimation in mobile robots (8)

b) List and explain the major challenges faced in implementing SLAM in real-world environments. (6)

OR

18 a) Explain the Decomposition strategies used in map representation (7)

b) State the mathematical definition of SLAM and explain the concept with respect to localization and mapping in mobile robots. (7)

Module V

19 a) Explain Dijkstra's algorithm for path planning in mobile robots with a suitable example. (7)

b) Discuss the concept of Modularity for code reuse and sharing. (7)

OR

20 a) Explain the D* algorithm with a suitable example. (7)

b) Describe the concept of potential field-based path planning in mobile robots. (7)

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