JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST–1 EXAMINATION - 2026

B.Tech–V Semester (CSE/IT)

COURSE CODE (CREDITS): 25B1WCI542 (2) **MAX. MARKS:** 15

COURSENAME: Intelligent Robotics and Autonomous Systems

COURSE INSTRUCTORS: Dr. Vikas Baghel **MAX. TIME:** 1 Hour

Note: (a) All questions are compulsory.

(b) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.

(c) Use of calculators is allowed.

Q.No	Question	CO	Marks
Q1	**(a)** What is ROS, and why is it used in robotics? Briefly explain the role of nodes, topics, services, and actions in ROS 2.	CO1	[2]
	(b) Apply the appropriate ROS 2 commands to write the sequence required to create a C++ package named `robot_controller` with a `control_node`, using `rclcpp`, `std_msgs`, and `geometry_msgs` as dependencies. Include the commands required to build the package, source the workspace, and run the node.		[3]

	(c) Create a ROS 2 C++ node named `square_subscriber` that subscribes to an integer topic `/number`. Whenever it receives a number, calculate its square and display:
	`Received: 5`
	`Square: 25`
			[4]

Q2	**(a)** Create a URDF file for a two-link robot in which `base_link` is a cylinder of radius 0.5 m and height 0.2 m, `link1` is a box of size $1.0 \times 0.2 \times 0.2$ m, and the two links are connected by a revolute joint at `xyz="0 0 0.1"` with the joint axis along `0 0 1` and limits of -1.57 to 1.57 radians.	CO2	[4]
	(b) A robot point $P = (0, 1, 0)$ is rotated 180° about the X-axis and then translated by $T = (1, 2, 3)$. Find the final coordinates using quaternion rotation and translation.		[2]

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