

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATIONS-2022

B.Tech-VII Semester (ECE)

COURSE CODE (CREDITS): 18B1WEC737 (3)

MAX. MARKS: 25

COURSE NAME: ROBOTIC SYSTEMS AND CONTROL

COURSE INSTRUCTORS: Dr. Emjee Puthooran/ Mr. Mukund Mitra

MAX. TIME: 1 Hour and 30 Minutes

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*Note: All questions are compulsory. Marks are indicated against each question in square brackets.*

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Q1. Write various electronic and mechanical components used in robots. What are the different types of sensors used in robots. Classify camera and explain each of its type based on applications [CO2, 5 marks]

Q2. What is DOF? What is the DOF of a rigid spherical ball in space? What is the DOF of a cylindrical joint and a rotary joint? Explain each with simple diagram. [CO3, 5 marks]

Q3. Derive the angular velocity vector of a point on a rigid body undergoing pure rotational motion. [CO3, 5 marks]

Q4. Prove that  $R_x(\theta_1)R_y(\theta_2) \neq R_y(\theta_2)R_x(\theta_1)$  [CO3, 2 marks]

Q5. Prove that  $R_z(\theta_1)R_z(\theta_2) = R_z(\theta_2)R_z(\theta_1) = R_z(\theta_1 + \theta_2)$  [CO3, 3 marks]

Q6. A frame {C} is rotated by  $20^\circ$  to get frame {B}. Frame {B} is then rotated by  $40^\circ$  to get frame {A}. A point "P" in frame {C} is given by  $[2 \ 4 \ 6]^T$ . What is its position vector with respect to frame {A}? [CO3, 5 marks]

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