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**Question Paper :U5104**

M.E. DEGREE EXAMINATION, NOV 2024

Professional Elective

CAD / CAM

21PCD505-INDUSTRIAL ROBOTICS AND EXPERT SYSTEMS

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 20 = 100 Marks)

1. (a) How do the anatomical design features of robots influence their precision movement capabilities, and what role do various sensors play in enhancing this precision in robotic systems? CO1- U (20)  
Or  
(b) How can the principles of robot kinematics be applied to improve the control of robotic manipulators, and what challenges arise in achieving accurate motion and positioning during complex tasks? CO1- U (20)
2. (a) Develop a design for an electro-hydraulic servo valve system that enhances the responsiveness and accuracy of a robotic manipulator in a manufacturing setting. CO3- App (20)  
Or  
(b) How do the design characteristics of vacuum, magnetic, and air-operated grippers influence their effectiveness as end effectors in robotic systems, and what factors should be considered when selecting an appropriate gripper for specific industrial applications? CO3- App (20)
3. (a) Choose the most suitable proximity and range sensor for a robot tasked with identifying objects in a cluttered environment, and explain the advantages of your selection. CO3- App (20)  
Or  
(b) Identify the best method for determining the orientation of an object in robotic pick-and-place operations, and explain how it impacts the robot's performance. CO3- App (20)

4. (a) What are the key technological advancements in mining robotics, and how do these innovations improve efficiency, sustainability, and productivity in modern farming practices? CO4- App (20)

**Or**

- (b) Develop a safety protocol for robotic operations in a nuclear facility, addressing the specific risks associated with radiation and hazardous materials. CO4- App (20)

5. (a) Identify key characteristics of textual robot programming languages and explain how they can be utilized to optimize robot motion control in a pick-and-place operation. CO5- App (20)

**Or**

- (b) How can you analyze the impact of artificial intelligence applications in robotics on the autonomy and decision-making capabilities of robotic systems, and in what ways can these enhancements lead to increased efficiency in specific industries? CO5- App (20)