Reg. No. : | | | | | | | | | | | | |

Question Paper Code: U7403

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2024

Professional Elective

Mechanical Engineering

21MEV403 INDUSTRIAL ROBOTICS

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Who is considered one of the pioneers of modern robotics with his work on industrial robots? CO1-U

   (a) Isaac Asimov (b) George Devol (c) Alan Turing (d)Nikola Tesla

2. What is a primary advantage of stepper motors in robotic applications? CO1- U

   (a)They are capable of very high speeds

   (b) They provide precise control of movement in discrete steps.

   (c) They have very high power output.

   (d) They operate without any electrical power.

3. In inverse kinematics, what is determined from the desired position of the end-effector? CO1- U

   (a) The end-effector's path.

   (b)The joint angles needed to achieve that position.

   (c) The robot's total weight

   (d) The robot's energy efficiency.

4. Which type of sensor is often used for mapping and obstacle detection? CO1- U

   (a) Tactile Sensor (B) Proximity Sensor

   (c) Range Sensor (d) Temperature Sensor

5. Which of the following represents a situation where a contact force is insufficient to prevent slipping, leading to breakage? CO1- U

(a) Rolling contact (b)Sliding contact (c)Breaking contact (d)Static contact

6. Which drive system uses compressed air to operate robotic components? CO1- U

(a) Pneumatic drives (b)Hydraulic drives

(c)Mechanical drives (d) Electrical drives

7. Which of the following algorithms is often used for motion planning in non-holonomic wheeled mobile robots? CO1- U

(a) Algorithm (b)Dijkstra's Algorithm

(c)Rapidly-exploring Random Tree (RRT) (d) Prim's Algorithm

8. The controllability of a non-holonomic system is typically analyzed using which mathematical tool? CO1- U

(a) Laplace Transform (b) Kalman Filter

(c) Lie Bracket (d) Fourier Transform

9. Household robots often include which type of technology to navigate and clean efficiently? CO1- U

(a) GPS navigation (b)Infrared sensors

(c)High-altitude cameras (d) Arm actuators

10. Robots used for inspection in manufacturing typically utilize which of the following? CO1- U

(a) Welding torches

(b)High-resolution cameras and sensors

(c)Grippers and manipulators

(d) Cleaning brushes

PART – B (5 x 2= 10Marks)

11. What are the benefits of industrial robots? CO1 -U

12. Explain the concept of continuous path control in robotics. CO1 -U

13. Name the different types of grippers in robotic systems. CO1 -U

14. What are non-holonomic constraints? CO4-App

15. Describe the impact of medical robots on surgical procedures CO1 -U

PART – C (5 x 16= 80Marks)

16.	(a)	How would the implementation of robots in an automotive assembly line affect production efficiency, product quality, and workplace safety?	CO3-App	(16)
		Or		
	(b)	Apply different types of automation to enhance a specific manufacturing process.	CO3-App	(16)
17.	(a)	How would you select appropriate tactile sensors for a robot designed for delicate handling?	CO2-App	(16)
		Or		
	(b)	Design a tactile sensor for pick and place operation and explain its advantages over other types of sensors	CO2-App	(16)
18.	(a)	Analyze the factors that influence the design of a robotic gripper for high-speed tasks.	CO5-Ana	(16)
		Or		
	(b)	Analyze the advantages , disadvantages , application of hydraulic drives in Industrial applications.	CO5-Ana	(16)
19.	(a)	Explain the difference between omnidirectional and non-holonomic wheeled mobile robots.	CO5-Ana	(16)
		Or		
	(b)	Compare between the significance of holonomic versus non-holonomic constraints in robot design.	CO5-Ana	(16)
20.	(a)	Design a robotic system for spray painting large, complex surfaces.	CO4-App	(16)
		Or		
	(b)	How would implementing a comprehensive safety program impact employee morale and productivity in an industrial setting?	CO4-App	(16)