QPC: RN18001292 AR - 18 Reg. No. | | | | | | | | | | |

GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, November – 2021

(Seventh Semester)

BMEPE7042 – **ROBOTICS and ROBOT APPLICATIONS**

(Mechanical Engineering)

Time: 3 hrs Maximum: 100 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) (2 x 10 = 20 Marks)

Q.1. Answer *ALL* questions	[CO#]	[PO#]
a. Robot is derived from Czech word _____ .	CO1	PO1
(i) Rabota (ii) Robota		
(iii) Rebota (iv) Ribota		
b. The main objective(s) of Industrial robot is to _____ .	CO1	PO1
(i) To minimise the labour requirement (ii) To enhance the life of production machines		
(iii) To increase productivity (iv) All of these		
c. The Robot designed with Polar coordinate systems has _____ .	CO1	PO1
(i) Three linear movements (ii) Three rotational movements		
(iii) Two linear and one rotational movement (iv) Two rotational and one linear movement		
d. ____ is a collection of mechanical linkage connected by joints.	CO2	PO1
(i) End effector (ii) Gripper		
(iii) Sensor (iv) Manipulator		
e. Up and down motion along an axis known as ____ in robotics.	CO2	PO1
(i) Pitch (ii) Roll		
(iii) Yaw (iv) None of the above		
f. Which type of motion is possible in cylindrical coordinate robots?	CO2	PO1
(i) 2 linear and 1 rotational motion (ii) 3 linear and 1 rotational motion		
(iii) 3 rotational motion (iv) 3 linear motion		
g. The speed at which robot is capable of manipulating its end effector is known as the____.	CO3	PO1
(i) Velocity of robot (ii) Maximum reach		
(iii) Speed of movement (iv) Load carrying capacity		
h. For a robot unit to be considered a functional industrial robot, typically, how many degrees of freedom would the robot have?	CO3	PO1
(i) 3 (ii) 6		
(iii) 4 (iv) 8		
i. Internal state sensors are used for measuring _____ of the end effector.	CO4	PO1
(i) Position (ii) Position & Velocity		
(iii) Velocity & Acceleration (iv) Position, Velocity & Acceleration		
j. ____ sensors are used to identify objects for pick and place purpose.	CO4	PO1
(i) Range detectors (ii) Infrared sensors		
(iii) Photo-metric sensors (iv) Vision sensors		

PART – B: (Short Answer Questions) **(2 x 10 = 20 Marks)**

Q.2. Answer ***ALL*** questions	[CO#]	[PO#]
a. What are the main advantages of robotics ?	CO1	PO1
b. How does a robot differ from an automated machine	CO1	PO1
c. Define various functions of a robot ?	CO1	PO1
d. List out various objectives of using industrial robots	CO1	PO1
e. What do you mean by homogeneous transformation?	CO2	PO1
f. How can you define a manipulator ?	CO2	PO1
g. Differentiate between Lagrange Euler and Newton Euler Formulation	CO3	PO1
h. What are the advantages of Euler-Lagrange formulation?	CO3	PO1
i. What do you mean by Torque sensor?	CO4	PO1
j. Write down the importance of Robot in Spot welding.	CO4	PO1

PART – C: (Long Answer Questions) **(15 x 4= 60 Marks)**

Answer ***ALL*** questions	Marks	[CO#]	[PO#]
3. a. State the advantages and disadvantages of robot ?	5	CO1	PO1
b. A Cartesian robot has a slide with a total range of 1.2 m and it is desired that it will have a control resolution of 4.6 mm on this axis . Determine the bit storage capacity which the control memory must posses to accommodate this level of precision.	10	CO1	PO2
(OR)			
c. What are the various fields in which the robots used? Discuss them in detail.	7	CO1	PO1
d. Sketch and explain the four basic robot configurations classified according to the coordinate system.	8	CO1	PO1
4. a. Explain DH parameters.	10	CO2	PO2
b. What is Forward Kinematics Explain?	5	CO2	PO2
(OR)			
c. The coordinate of a point $P_{abc} = (4,3,2)^T$ in the body coordinate frame OABC are rotated through 45^0 about OZ-axis. Determine the coordinates of the vector P_{xyz} with respect to base reference coordinate frame.	10	CO2	PO2
d. Enlist some advanced technological features of modern robots.	5	CO2	PO1
5. a. Discuss the application of Lagrangian Newtonian techniques in writing the equation of motion for Robotics.	10	CO3	PO2
b. What do you mean by Jacobian matrix?	5	CO3	PO1
(OR)			
c. What are the singularities of a manipulator? How are they classified?	8	CO3	PO2
d. Distinguish between Euler-Lagrange and Newton-Euler formulation.	7	CO3	PO1
6. a. Explain Pneumatic actuators system with neat sketch.	7	CO4	PO2
b. Explain the various drive system used with an industrial robot and compare their features, merits and demerits.	8	CO4	PO2
(OR)			
c. Explain application of robot in robot continuous arc welding.	8	CO4	PO2
d. What are the uses of sensor in robotics? Write down the various types of sensors used in robotics?	7	CO4	PO2

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