

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Sixth Semester B.Tech Degree (Hons.) Examination June 2020

Course Code: EC368**Course Name: Robotics**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer any two full questions, each carries 15 marks*

Marks

- 1 a) List out the robot components and explain the Robot Anatomy. (5)
- b) Compare the following Robot Specifications (i) Reach and Stroke (ii) Repeatability (4)
- c) With relevant diagrams, explain the working principle of BLDC Motor. (6)
- 2 a) What are the characteristics of sensors? Explain position and displacement sensor. (7)
- b) How speed and direction is controlled in electric motor with the help of Microprocessor? (8)
- 3 a) Explain different robot configurations. (10)
- b) Mention the different applications of robot. (5)

PART B*Answer any two full questions, each carries 15 marks*

- 4 a) Mention any five image processing techniques. (10)
- b) A point $P(3,7,1)^T$ is attached to a frame F and is subjected to the following transformations. Find the co-ordinates of the point relative to the reference frame at the conclusion of transformations (5)
 - (i) Rotation of 90 degree about the y-axis,
 - (ii) Followed by a Rotation of 90 degree about the z-axis,
 - (iii) Followed by a translation of (4,-3,7)
- 5 a) Derive the forward kinematic equation for a 3 DOF cylindrical configuration. (10)
- b) Compare forward kinematics and Inverse kinematics. (5)
- 6 a) What is Homogenous Transformation Matrix and how it is represented? (7)
- b) Describe the steps to find inverse transformation of a matrix with any example. (8)

PART C

Answer any two full questions, each carries 20 marks

- 7 a) Write a VAL program for a pick and place operation. List all the assumptions. (10)
b) What is Lagrangian Mechanics? (5)
c) Distinguish textual and lead through programming. (5)
- 8 a) Explain Industrial applications of robot in material handling and assembly. (10)
b) Derive Jacobian operator for linear and angular velocity of end-effectors? (10)
- 9 a) Mention any four recent developments in robotics. (10)
b) Write down all the sensor and end-effector commands in VAL. (5)
c) Explain PID controller with transfer function and block diagram. (5)
