VIT
Vellore Institute of Technology

SCHOOL OF MECHANICAL ENGINEERING

Continuous Assessment Test – II - Fall Semester 2019-2020

Programme Name & Branch: B TECH

Course Name & Code: ROBOTICS & MEE1030

Faculty Name(s): Dr Sudhir Raj

Class Number(s):VL2019201002279 **Slot:** B1 **Exam Duration:** 90 mins **Maximum Marks:** 50

General instruction(s):

Answer all the questions

S.No.	Question
	Section – A (5 x 2 = 10 Marks)
1	Describe a method for range measurement.
2	How Jacobian matrix is used to find the end effector velocity for three link planar manipulator?
3	Why gray scale is used in image processing?
4	Why sampling frequency is important in Analog to Digital conversion?
5	How Rotation matrix is used to find the Transformation matrix for a given robot?
	Section – B (4 x 10 = 40 Marks)
6	Derive the expression for Transformation matrix in terms of link length, link twist, link offset, and joint angle respectively.
7	A single-link robot with a rotary joint is motionless at $\theta = 15$ degrees. It is desired to move the joint in a smooth manner to $\theta = 75$ degrees in 5 seconds. Find the coefficients of a cubic which accomplishes this motion and brings the manipulator to rest at the goal. Plot the position, velocity, and acceleration of the joint as a function of time.
8	A part weighing 20 N is to be held by a gripper using friction against two opposing fingers. The coefficient of friction between the fingers and the part surface is 0.3. The g factor to be used in force calculations should be 3.0. Compute the required gripper force.
9.	An analog video signal is generated for each line of the faceplate comprising of 512 lines. The sampling capability of the A/D converter is 100 nanoseconds. This is the cycle time required to compute the A/D conversation process for one pixel. Use the American standard of 33.33 milliseconds (1/30 s) to scan the entire faceplate consisting of 512 lines, Determine the number of pixels that can be processed per line.