

Roll No.

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Paper ID [PE520]

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M.Tech (Sem. - 1st)

ROBOTICS AND INDUSTRIAL AUTOMATION (PE - 520)

Time : 03 Hours

Maximum Marks : 100

Instruction to Candidates:

- 1) Attempt any **Five** questions.
- 2) All questions carry equal marks.

- Q1)* (a) What are the major components of a robotic manipulator? Discuss.
(b) Differentiate between servo and non-servo manipulators.
- Q2)* (a) What are the basic characteristics of a robot-level language? Discuss with the help of an example.
(b) Differentiate between VAL and RAIL robot programming language.
- Q3)* (a) What is Denavit-Hartenberg notation for assigning frames to links and identifying joint link parameters? Discuss.
(b) Discuss the direct and inverse kinematic models.
- Q4)* Compute the linear as well as angular velocity of tool tip with respect to the base 3 frame for a two link planar manipulator. Assume the two joints as rotary joints.
- Q5)* Derive expressions for joint torque for single link planar robotic manipulator having rotary joint using Newton-Euler dynamics formulations.
- Q6)* Write short note on the following :
(a) Force Control of robotic manipulator.
(b) Optical encoder.
- Q7)* Discuss the following :
(a) Electrical Actuator.
(b) Automation systems.
(c) Pressure Control valves.
- Q8)* (a) What do you understand by Automated Guided Vehicle systems? Discuss.
(b) Discuss the quantitative analysis of single direction and continuous loop conveyor systems.

