

**B. VOC. Robotics and Automation**  
**Subject: Fundamentals of Robotic System**  
**Subject Code: RA-501**  
**Semester: First**  
**Session September 2022**  
**Theory (External): 35 Marks**  
**Time: 03 Hours**

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**Instructions to the Students**

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of short answers type in nature. All questions are compulsory. Each question carries 1 mark.
3. Section B comprises 8 essay type questions out of which students need to do any 5. Each question carries 5 marks.
4. Read the questions carefully and write the answers in the answer sheets provided.
5. Do not write anything in the question paper.
6. Whenever necessary, the diagram drawn should be neat and properly labelled

**Roll Number**

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**SECTION – A (OBJECTIVE TYPE QUESTIONS)**  
(10 × 1 = Marks)

- A. What do you understand by line vector and free vector?
- B. What do you understand by homogeneous transformation matrix?
- C. Classify the robot as per the type of control and mobility.
- D. What is path-update rate? What is this rate in typical manipulator systems?
- E. What is meant by pitch, yaw and roll?
- F. How the load carrying capacity of a manipulator is designed?
- G. What do you understand by direct-drive configuration of an actuator?
- H. What is the main disadvantages of using gear in power transmission?
- I. Explain the terms repeatability and accuracy in any manipulator design.
- J. What are active and passive grippers?

**SECTION – B (ESSAY TYPE QUESTIONS)**  
(5×5 = 25)

1. Differentiate between serial manipulators and parallel manipulators.
2. Explain the coordinate transformations between frames with a common origin with example.

3. Explain the various drive system used with an industrial robot and compare their features, merits and demerits.
4. How the grippers are selected based on the applications? Analyze the gripper force to be used in various linkage mechanisms.
5. Explain the steps involved in Trajectory planning.
6. Compare the pneumatic drive robots with stepper motor drive robots.
7. Describe the welding operation with robot system.
8. Discuss the performance characteristics of actuators. Compare electrical, pneumatic & hydraulic actuators for their characteristics.

END OF PAPER