

Enroll No

K.E.Society's
Rajarambapu Institute of Technology, Rajaramnagar
 (An Empowered Autonomous Institute, affiliated to SUK)
Mid Semester Examination (2025-26)
 Final Year B.Tech.-CSE (AI & ML)
Course Code: AI415 Course Name: PE-IV Robotics

Q.P.Code
MS4

Day & Date: Friday, 19.09.2025

Time: 3.15 to 5.15 pm

Marks: 50

Instructions:

- 1) All questions are compulsory.
- 2) Figures in rounded () brackets within the question, indicate the scheme of marking for respective part of the question, whereas figures in the first right column indicate total marks for that whole question.
- 3) CO is the index number of the Course Outcome statement.
- 4) The Bloom's taxonomy level (BL) for 1,2,3,4,5 and 6 is remember, understand, apply, analyze, evaluate and create respectively.
- 5) Assume suitable data if necessary.
- 6) Use of non-programmable calculators is allowed

Q.1 Answer the following

- (a) Enlist major types of robots (4) & elaborate two real-world applications for each type (4). **08 CO1 BL3**
- (b) Discuss the role of robots in manufacturing, healthcare & space applications (4). Provide examples highlighting how robotics has transformed each field (4). **08 CO1 BL3**

(OR)

- (b) Compare & contrast industrial robots (4) & service robots (4) in terms of their structural design, applications & operational environment. **08 CO1 BL4**

Q.2 Answer the following

- (a) Evaluate different robotic arm electric actuators a DC motors (2), AC motors (2), Stepper motor (2) and justify your choice considering torque-speed (2). **08 CO4 BL6**
- (b) Compare the performance of pneumatic (2) and hydraulic actuators (2) for a robotic gripper application. **04 CO4 BL4**
- (c) Evaluate different robotic arm electric actuators a DC motors (1), AC motors (1), Stepper motor (1) and justify your choice considering torque-speed (2). **05 CO4 BL4**

(OR)

- (c) Elaborate potentiometer (1), optical encoder (1), LVDT (1) type position sensor in detail, evaluate which sensor is best for minimizing the position error and justify with reasoning (2). **05 CO4 BL3**



Q.3 Answer the following

- (a) Analyze the difference between forward kinematics and inverse kinematics (4). Provide an example where inverse kinematics may yield multiple solutions and discuss how to choose the most feasible solution (4). **08 CO3 BL4**
- (b) Design angular speed (2) and torque of a drive system for a two-wheeled mobile robot using DC motors (3) for payload of 5kg, with speed of 0.5 m/s and radius of wheel is 0.05 m. **05 CO3 BL4**
- (c) Compare and evaluate the performance of cubic polynomial trajectory planning vs. trapezoidal velocity profile for pick-and-place operations (4). **04 CO3 BL4**
- (OR)**
- (c) For a 2-link planar robot arm with link lengths $L_1=1$ m, $L_2=1$ m, compute the forward kinematics to find the end-effector position for $\theta_1=30^\circ$ and $\theta_2=45^\circ$ (4) **04 CO3 BL5**

