

Exam.Code:0941
Sub. Code: 7054

1128
B. E. (Mechanical Engineering)
Fifth Semester
MEC-503: Robotics

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Unit.

x-x-x

- I. Attempt the following:-
 - a) What is SCARA?
 - b) How robots are specified?
 - c) Define payload capacity of a robot.
 - d) What do you mean by dynamics of robotics?
 - e) Why dexterous work envelope is always smaller than the total work envelope?

UNIT - I

- II. a) Explain the four basic configuration of robot arm with the help of neat sketches.
b) What do you understand by robot workspace? Draw the workspace for cylindrical and spherical robot arms. (5,5)
- III. a) Derive the matrix that represents a pure rotation about Z-axis of the reference frame.
b) The co-ordinates of a point q_{abc} is given by $(7, 5, 3)^T$ which is rotated about the OX-axis of the reference frame OXYZ, by angle of 60° . Determine the co-ordinates of the point q_{xyz} . (5,5)
- IV. Explain and develop DH algorithm for four axis ADAPT-1 SCARA robot. (10)

UNIT - II

- V. a) Explain analog to digital conversion techniques step by step.
b) The revolute joint of an articulated PTP robot traverses from an initial position of 10° to 540° final position, in 3 seconds. Assuming a third degree polynomial and start-off acceleration 3 deg. /sec, determine deceleration at the end of 3 seconds. (5,5)
- VI. a) Explain optical proximity sensor working principle with sketch.
b) Write applications of torque sensors in defence and industries. (5,5)
- VII. a) Describe VAL commands.
b) Explain robotic vision with block diagram. (5,5)

x-x-x