

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E -IVth SEMESTER-EXAMINATION – MAY- 2012

Subject code: 742801

Date: 12/05/2012

Subject Name: Robotics and Control

Time: 02:30 pm – 05:00 pm

Total Marks: 70

Instructions:

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**

- Q.1 A Derive the kinematic equations for the SCARA robot giving coordinate frame diagram and the kinematic parameters. 07
- B (I) Enlist the robot specifications and explain each of them briefly. 04
- (II) Show work space for Cartesian robot, Polar Robot & Revolute robot. 03
- Q.2 A The differential equation describing a joint in a robotic manipulator is as below 07
 $2.5 \frac{d^2y}{dt^2} + 20 \frac{dy}{dt} + 40y = 0$. Determine the following:
1. Delay time
 2. Settling time
 3. Peak overshoot
- B With block diagram and transfer function, explain the following. 07
1. Proportional Control
 2. Derivative Control
 3. Integral Control
- OR
- B Describe with a neat sketch degrees of freedom associated with a robot wrist. 07
- Q.3 A Explain the steps involved in D-H algorithm. 07
- B Explain briefly as applied to robot arm dynamics analysis 07
1. Kinetic energy
 2. Potential Energy
 3. Joint velocity
- OR
- Q.3 A Explain the use of damping factor and natural frequency in deciding the response of a robotic joint described by a differential equation 07
- B Describe desirable features for sensors and sensors in robotics. 07
- Q.4 A Explain the procedure A/D conversion. 07
- B With neat sketch explain tactile and range sensors 07
- OR
- Q.4 A Describe different path control modes in robotics. 07

- B Develop a model for the transfer function of a dc motor driving a robot joint. 07
- Q.5 A Explain how performance of a robot is studied. 07
- B Define and illustrate the link and joint parameters. Explain their uses. 07
- OR
- Q.5 A Explain the training of vision system 07
- B What is object recognition? Explain template matching. 07
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