P2990

SEAT No. :

[5154]- 555

B.E. (Mechanical)

ROBOTICS

(2012 Pattern) (Semester - II) (Elective - III) (402049 B) (End Sem.)

Time :2½ Hours]   *[Max. Marks :70*

Instructions to candidates:

    1)   *Figures to the right indicate full marks.*

    2)   *Draw neat figures wherever necessary.*

    3)   *Use of Scientific Calculators is allowed.*

Q1) a)   State any two laws of Robotics.   **[4]**

         Suggest which configuration robot is suitable for following application and justify.

    b)   i)   Spray Painting

         ii)   Pick & Place

         iii) Fastening a screw to car body.   **[6]**

OR

Q2) a)   Explain the construction of Brushless DC Motor with neat sketch.   **[4]**

    b)   Explain the steps involved in DH notation process.   **[6]**

Q3) a)   Describe any three basic parameters used in DH notation algorithm. **[6]**

    b)   Explain different joints used in robots.   **[4]**

OR

Q4) a)   Explain sensor selection criteria for robotic applications.   **[4]**

    b)   Explain with neat sketch linear and rotational velocities of rigid bodies.**[6]**

Q5) a) What is Cartesian space trajectory planning? What are general considerations in trajectory planning? **[8]**

b) Derive transformation matrix for mapping velocity of a 3DoF manipulator having first and third joints as Rotating joints and second joint as prismatic joint. **[8]**

OR

Q6) a) Derive Lagrangian- Euler formulation for single link with rotary joint. Derive an expression for torque at joint. **[10]**

b) What are different tools used in simulation of Robotics? **[6]**

Q7) a) Describe the different steps in trajectory planning. **[8]**

b) An actuated joint of a six axis Robot is to be rotated from 20° to 80° in 6 seconds. Determine linear, Quadratic, and Cubic trajectories for the joint. **[8]**

OR

Q8) a) Write and explain general block diagram of robot control system. **[8]**

b) A spring mass system has m=2.2kg, b=7.5, k=3.5. If the gain in the velocity control is 2.5. Determine the control law to make the system critically damped. Compare the behavior of the system without gains by plotting the graph assuming x(0) and velocity (0)=1.2. **[8]**

Q9) a) Explain steps in Image processing and analysis. **[8]**

b) Write a short notes on: **[10]**

i) Artificial neural network

ii) ANT algorithm

OR

*Q10)*a) Explain with block diagramme Machine vision system for Robots. **[10]**

b) Explain Image acquisition and Sampling. **[8]**

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