Total No. of Questions : 10]

SEAT No. :

P3056

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[5354] - 545

B.E. Mechanical

ROBOTICS (ELECTIVE - III)

(2012 Pattern) (Semester - II)

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 three laws of Robotics. **[4]**

b) What is D-H parameter? Obtain an expression for D-H parameter matrix. **[6]**

OR

Q2) a) What are Homogeneous Transformation & Homogeneous Transformation Matrix? **[4]**

b) Write a short note on **[6]**

i) Algebraic Approach

ii) Geometric Approach

Q3) a) Describe the four basic parameters used in DH notation algorithm **[4]**

b) Explain with neat sketch static forces in manipulator. **[6]**

OR

Q4) a) Explain properties of Jacobian matrix of a manipulator. **[4]**

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

P.T.O.

Q5) a) Derive an equations of motion for serial manipulators using Lagrangian formulation **[8]**

b) Derive an equations of motion for parallel manipulators using Lagrangian formulation **[8]**

OR

Q6) a) A rotary arm of a manipulator is to rotate from 20°to 80° in 6 seconds. Determine coefficients of cubic polynomial to interpolate a smooth trajectory. Plot the position, velocity and acceleration variation against time **[10]**

b) What are the different tools used in simulations of robot? **[6]**

Q7) a) Explain independent joint of PID control. **[8]**

b) Explain in detail Trajectory planning of robot with its advantages? **[8]**

OR

Q8) a) Explain in detail force control of manipulators **[8]**

b) Fig. shows as error time graph. Sketch the PD controller o/p w.r.t. time. Assume kp=5, Kd=0.5 & Po=30% i.e. controller o/p is 30% when error is zero. **[8]**

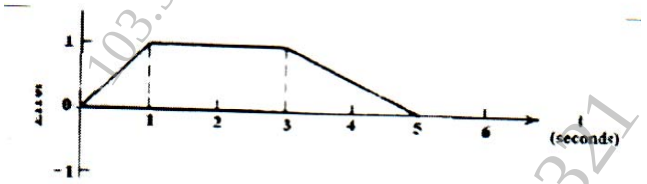

Figure 3

Q9) a) Explain Necessity & application of Artificial Intelligence for Robotics System. **[8]**

b) Explain the forward & backward search technique in problem solving for AI **[10]**

OR

Q10)a) Explain in detail Image Processing Techniques and Image Segmentation? **[12]**

b) Write short note on linear Kalman Filter? **[6]**