

R09**Code No: D0404****JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M.TECH II - SEMESTER EXAMINATIONS MARCH/APRIL 2011****INDUSTRIAL ROBOTICS****(CAD/CAM)****Time: 3hours****Max.Marks:60**

Answer any five questions
All questions carry equal marks

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1. a) Explain briefly about the three types of automation.
 b) Explain the two important characteristics of dynamic performance. [12]
2. a) Explain the working principle of potentiometer and digital encoder.
 b) Explain about the power transmission systems employed in industrial robotics. [12]
3. a) Explain the three common types of motion that a robot manipulator can make in traveling from point to point.
 b) A Cartesian co-ordinate robot is to move its three axis from position $(x,y,z)=(0,5,5)$ to position $(x,y,z)=(20,35,15)$. All the distances measures in cms. The maximum velocities for the three joints are, respectively, 20 cm/sec, 1cm/sec, and 10 cm/sec. [12]
 - i) Determine the time required to move each joint if slew motion is used
 - ii) Determine the time required to move the arm and the velocity of each joint, if the joint interpolation is used. [12]
4. a) The following table is the link parameter table of spherical robotic manipulator

Link parameter table

Link	a	α	θ	d
1	0	$+90^\circ$	θ_1	0
2	0	-90°	θ_2	0
3	0	0	0	d_3

Find the set of joint displacements to move to the position

 $T_3 =$

n_x	o_x	a_x	p_x
n_y	o_y	a_y	p_y
n_z	o_z	a_z	p_z
0	0	0	1

[12]

Contd....2

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5. a) Explain the working of the magnetic and vacuum cup grippers. [12]
b) Discuss about the proximity sensors.
6. a) Explain the capabilities and limitations of lead through programming [12]
b) Discuss the generations of robot programming languages.
7. a) What are the general considerations in robot work cell design. [12]
b) Discuss about work cell control.
8. a) What are the features of the spray painting robot? [12]
b) Discuss briefly about the robot inspection.

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