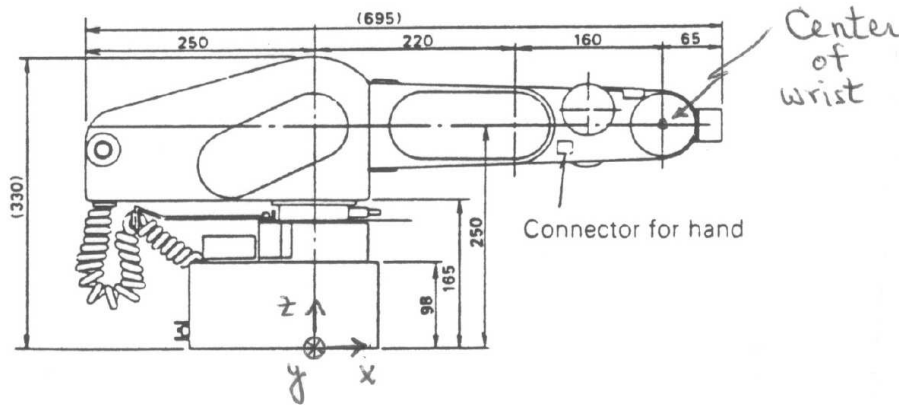


# ECE 763

## Homework #1

### Problem:

For the Mitsubishi RM-501 robot, determine the position of the wrist in Cartesian coordinates  $(p_x, p_y, p_z)$  as a function of the joint coordinates  $(a_1, a_2, a_3)$  for the waist, shoulder, and elbow, respectively. Use the inertial coordinate system shown in the figure below. (Its origin is on the first axis, for the waist.) Assume that the joint angles are given in number of steps (pulses) from the NEST position (body turned fully clockwise, shoulder all the way up and back, elbow all the way down) and the wrist coordinates are to be given in millimeters. (See the Move Immediate command for information on the relationship between the operating range and the joint angle values, in steps, after the execution of NEST.)



In addition to giving the equations for  $(p_x, p_y, p_z)$ , compute the wrist position for the following three sets of joint angles and give the results. Are the results those that you would anticipate through simple inspection of the configuration?

Angle	#1	#2	#3
$a_1$	-6000	-6000	-2400
$a_2$	-4000	-400	-400
$a_3$	3600	0	0