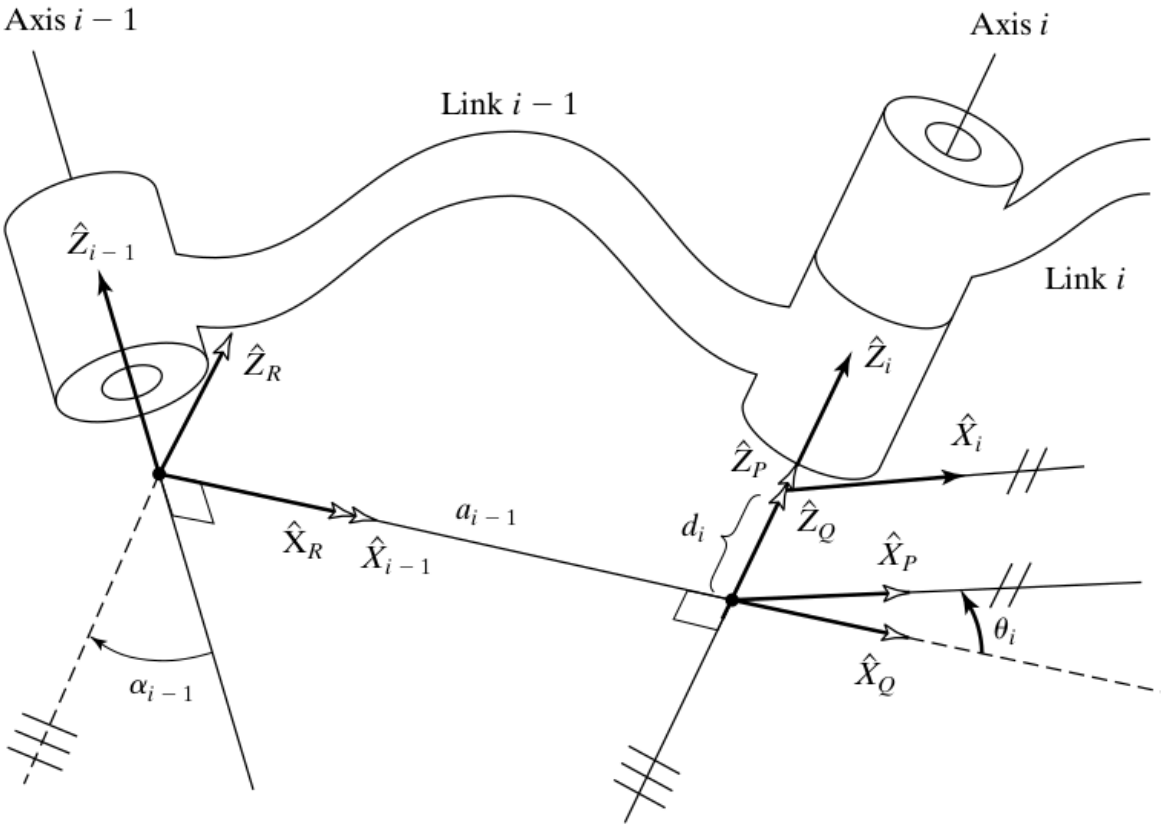
MEC503 Wi22 Exam Session-1

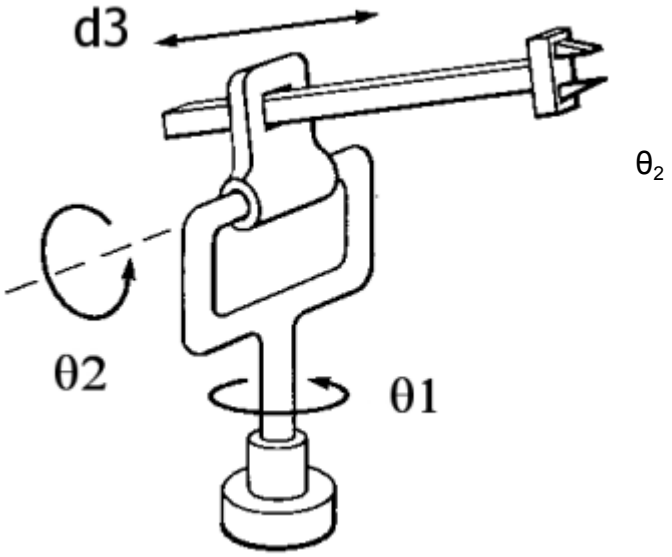
Q.1 [10 marks] Determine the link transformation matrix that defines frame {i} relative to frame {i-1}. Show the intermediate transformations from frames {i-1}, {R}, {Q}, {P},



and finally {i}.

Q.2 [20 marks] Consider the RRP manipulator shown

(a) [6 marks] Draw a schematic of this manipulator, with the axes of frames {0} through {3} labeled. Also, include the parameters θ_1 , θ_2 , a_2 , and d_3 on your schematic. Assume that in this diagram, the slider bar is parallel to the ground and that this is the configuration where $\theta_1 = 0$, $\theta_2 = 90^o$.



(b) [8 marks] Write down the Denavit-Hartenberg parameters for this manipulator, in the form of a table:

i	a_{i-1}	α_{i-1}	d_i	θ_i
1				
2				
3				

(c) [6 marks] Derive the forward kinematics for this manipulator — that is, find ${}^0_3T$.