In-Class Test (#2)

Name _____
Student Number _____

ROBOTICS 4K03

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DURATION OF EXAMINATION: 50 MINS

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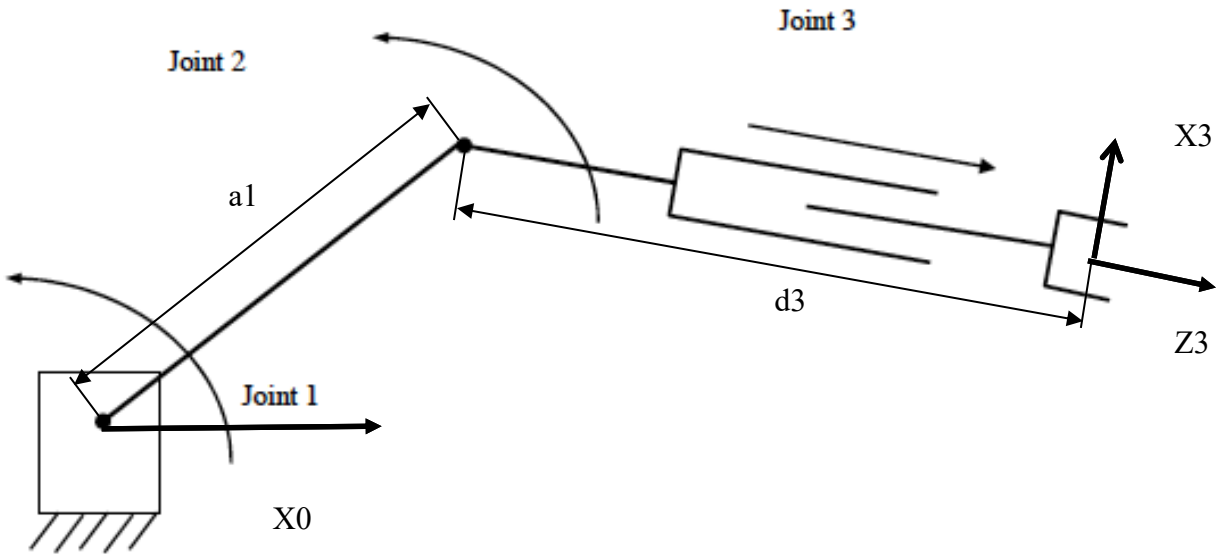
THIS EXAMINATION PAPER INCLUDES 2 PAGES AND 2 QUESTIONS. YOU ARE RESPONSIBLE FOR ENSURING THAT YOUR COPY OF THE PAPER IS COMPLETE. BRING ANY DISCREPANCY TO THE ATTENTION OF YOUR INVIGILATOR.

Use of Casio FX-991 calculator. This paper must be returned with your answers.

Questions:

1. (40 points) For the RRP planar robot shown in the following figure:
1) Assign the frames using the D-H method (X0, X3, and Z3 are given).
2) Determine the D-H parameters and put them in a table. Identify joint variables.
3) Draw a diagram of the robot that properly shows the D-H frames, the joint variables, and any *d* or *a* parameters that are non-zero.
4) Compute the *A* matrices and ${}^0T_3$.



2. (60 points) For the planar RR robot shown in the following figure, if $a_1 = 0.4m$ and $a_2 = 0.3m$:

1) Compute the A matrices and ${}^0T_2$.

2) Compute the Jacobian matrix.

3) Calculate v_x and v_y when $\theta_1 = 35°$, $\theta_2 = -75°$, $\dot{\theta}_1 = 100° / s$, $\dot{\theta}_2 = -50° / s$