



## EENG 428 Laboratory - Spring 2020

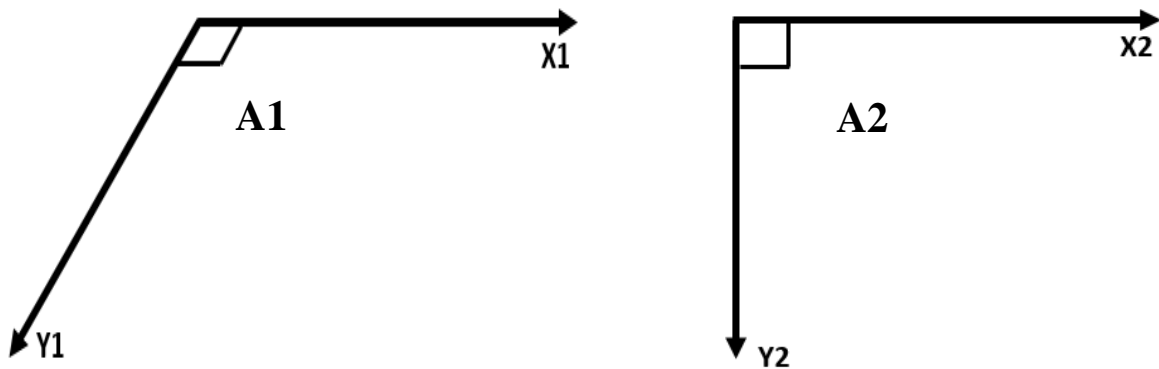
### Lab Worksheet 2

Name:

Student Number:

#### Exercise 1:

Complete the Coordinate Frames A1 and A2 by determining the correct direction of the Z axes using the **right-handed coordinate rule**



#### Exercise 2:

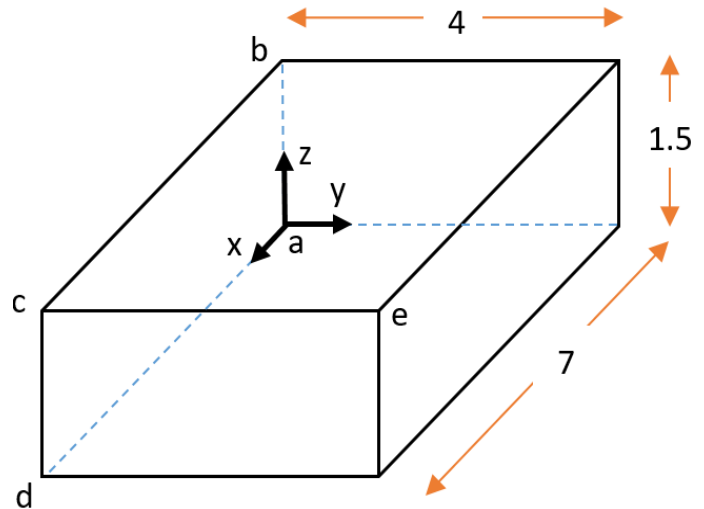
Consider the  $4 \times 4$  homogeneous transformation matrices  ${}^A T_B$

$${}^A T_B = \begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 1/\sqrt{2} & -1/\sqrt{2} & 5 \\ 0 & 1/\sqrt{2} & 1/\sqrt{2} & 7 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Find the homogeneous transformation matrix that represents frame A relative to frame B.

### Exercise 3

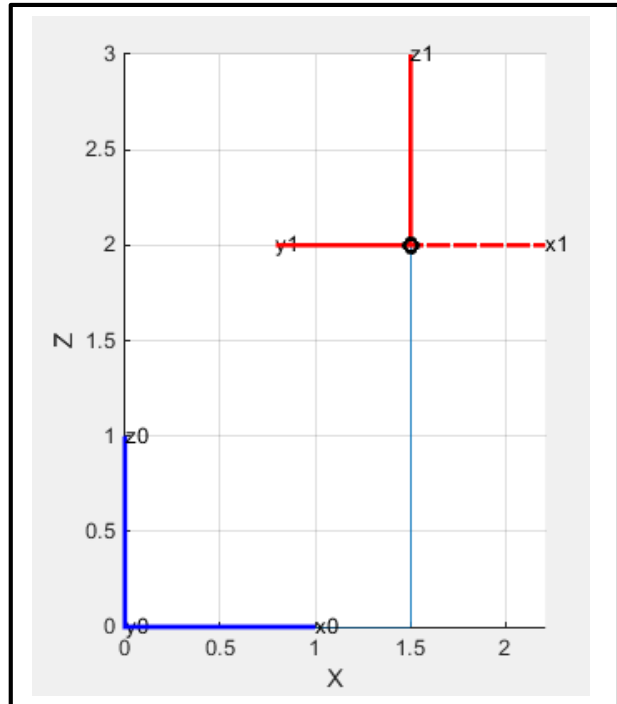
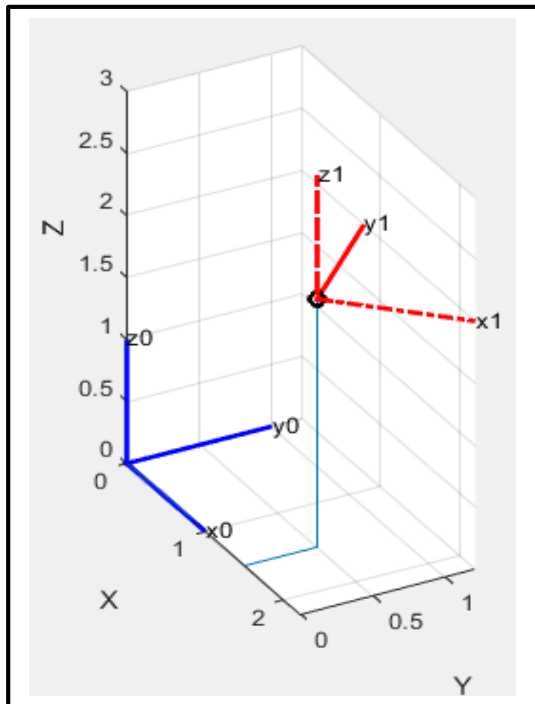
In the figure,  $x$ ,  $y$  and  $z$  are axes of a stationary reference coordinate frame Placed on the point  $a$ . A coordinate frame  $E$  is requested to be assigned to the block at point  $e$ , with all axes along the edges of the block.



- 1- Assign frame  $E$  axes ( $e_x$ ,  $e_y$  and  $e_z$ ) according to the right handed rule
- 2- Write the homogeneous transformation matrix  ${}^A E$

### Exercise 4

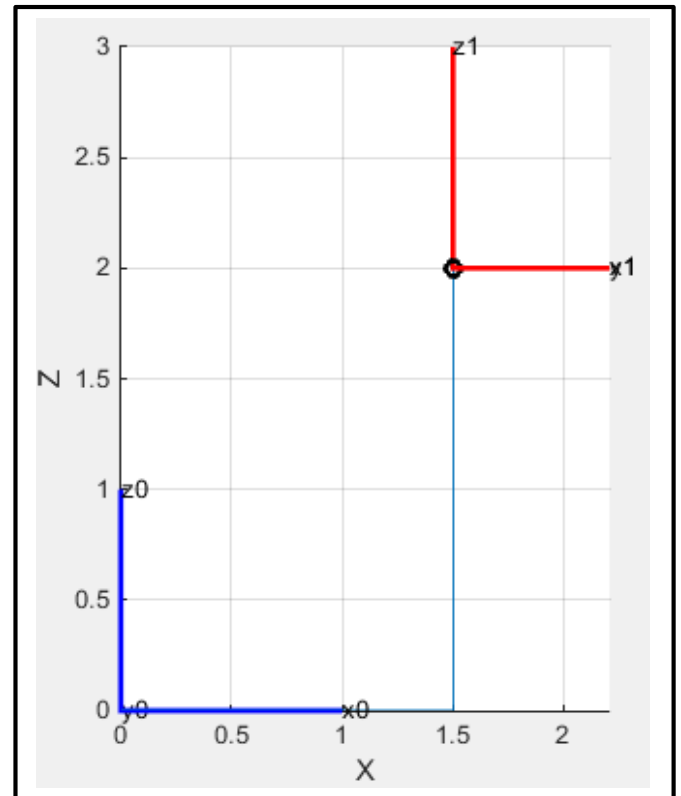
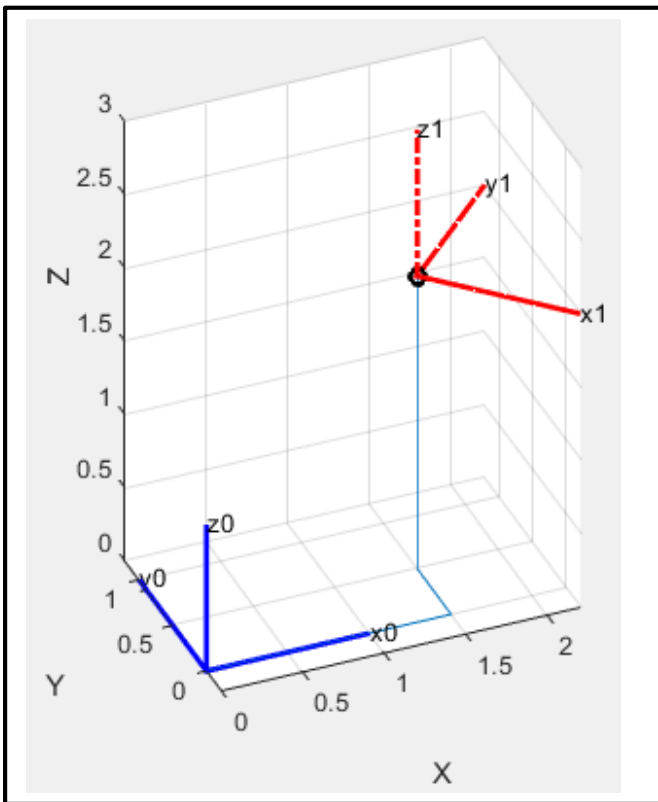
A different view of Two coordinate frames,  $A_0$ ,  $A_1$  shown in the Figures



- 1- Write the  $4 \times 4$  homogeneous transformation matrices  ${}^{A_1} A_0$
- 2- Write the  $4 \times 4$  homogeneous transformation matrices  ${}^{A_0} A_1$

## Exercise 5

A different view of Two coordinate frames, A0, A1 shown in the Figures



- 1- Write the  $4 \times 4$  homogeneous transformation matrices  ${}^{A1}A0$
- 2- Write the  $4 \times 4$  homogeneous transformation matrices  ${}^{A0}A1$