

# ECE 417 --- ROBOTICS

## Homework 2, Spring, 2021

Given the following 4x4 homogeneous transformation matrices:

$${}^B\mathbf{T}_A = \begin{bmatrix} 2/7 & -6/7 & 3/7 & 1 \\ 6/7 & 3/7 & 2/7 & 2 \\ -3/7 & 2/7 & 6/7 & 3 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$${}^C\mathbf{T}_B = \begin{bmatrix} 3/7 & 2/7 & 6/7 & 4 \\ 2/7 & 6/7 & -3/7 & 5 \\ -6/7 & 3/7 & 2/7 & 6 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

1. Give the inverse of Matrix  ${}^B\mathbf{T}_A$ .
2. What is the direction of the X-axis of system **A** w.r.t. system **B**? What is the direction of the Y-axis of system **A** w.r.t system **B**? Where is the origin of system **A** w.r.t. system **B**?
3. What is the direction of the X-axis of system **B** w.r.t. system **A**? What is the direction of the Y-axis of system **B** w.r.t system **A**? Where is the origin of system **B** w.r.t. system **A**?
4. What is  ${}^C\mathbf{T}_A$  ?
5. For the point  $(0, 1, 2)^T$  in system **A**, what are it's coordinates in system **B**?
6. For the point  $(0, 1, 2)^T$  in system **B**, what are it's coordinates in system **A**?