Problem 2

a) The angle of attack α is 7.595 degrees

b) The ground speed of the vehicle, represented by the velocity with respect to the inertial frame is

$$\begin{bmatrix} -9.55 \\ 12.78 \\ -1.85 \end{bmatrix}$$

Since z direction is +ve downwards in our convention, a -ve value for velocity in z-component denotes that it is <u>ascending</u>.

c) The ground speed is

$$\begin{bmatrix} -9.55 \\ 12.78 \\ -1.85 \end{bmatrix}$$

Its magnitude is 16.06.

Problem 3

i) v_B^E

ii) $\mathbf{V}_w$

iii) w_E

iv) R_w^B

v) R_B^E

We know that: $\mathbf{V} = v^E - w^E$

$\therefore \mathbf{V}_B = v_B^E - w_B^E$

Now, $\mathbf{V}_B = R_w^B \cdot \mathbf{V}_w$

Also, $w_B^E = R_E^B \cdot w_E = (R_B^E)^{-1} \cdot w_E = (R_B^E)^T w_E$

$\therefore R_w^B \cdot \mathbf{V}_w = v_B^E - (R_B^E)^T w_E$