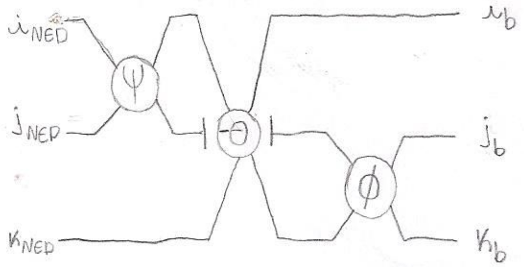
Questão 2-



$$\Rightarrow D_b^{NED} = \begin{array}{ccc} i_{ned} & j_{ned} & k_{ned} \\ \end{array}$$

$$D_b^{NED} = \begin{bmatrix} c\psi c\theta & s\psi c\theta & -s\theta \\ c\psi s\theta s\phi - s\psi c\phi & s\psi s\theta s\phi + c\psi c\phi & c\theta s\phi \\ c\psi s\theta c\phi + s\psi s\phi & s\psi s\theta c\phi - c\psi s\phi & c\theta c\phi \end{bmatrix}$$

Questão 3-

$$D_{NED}^{b} = \begin{bmatrix} c\psi c\theta & c\psi s\theta s\phi - s\psi c\phi & c\psi s\theta c\phi + s\psi s\phi \\ s\psi c\theta & s\psi s\theta s\phi + c\psi c\phi & s\psi s\theta c\phi - c\psi s\phi \\ -s\theta & c\theta s\phi & c\theta c\phi \end{bmatrix}$$

$$\rightarrow A_{NED} = D_{NED}^{b} \cdot A_b = D_{NED}^{b} \begin{bmatrix} 1 \\ 0 \\ \sqrt{3} \end{bmatrix} = \begin{bmatrix} c\psi c\theta + \sqrt{3}(c\psi s\theta c\phi + s\psi s\phi) \\ s\psi c\theta + \sqrt{3}(s\psi s\theta c\phi - c\psi s\phi) \\ -s\theta + \sqrt{3}\, c\theta c\phi \end{bmatrix}$$

Questão 5-

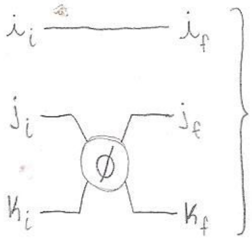
$g_b = ?$

$$g_b = D_b^{NED} \cdot g_{NED} = D_b^{NED} \begin{bmatrix} 0 \\ 0 \\ g \end{bmatrix} = g \begin{bmatrix} -s\theta \\ s\phi c\theta \\ c\phi c\theta \end{bmatrix} = m \cdot g_o \begin{bmatrix} -s\theta \\ s\phi c\theta \\ c\phi c\theta \end{bmatrix}$$

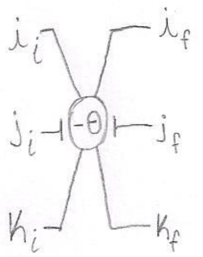
Questão 6-

$$g_b = 1000 \cdot 9{,}81 \begin{bmatrix} -\text{sen } 30° \\ \text{sen } 30° \cos 30° \\ \cos 30° \cos 30° \end{bmatrix} = \begin{bmatrix} -4905 \\ 4247{,}85 \\ 7357{,}5 \end{bmatrix}$$

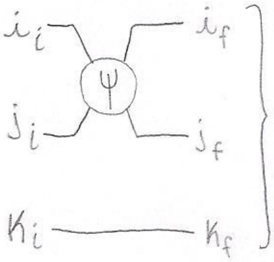
Questão 1-



$$R_x(\phi) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & c\phi & s\phi \\ 0 & -s\phi & c\phi \end{bmatrix} ;$$

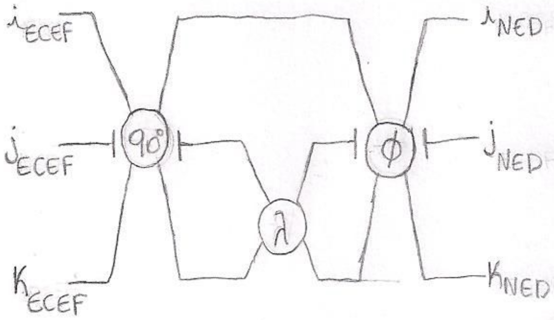


$$R_y(\theta) = \begin{bmatrix} c\theta & 0 & -s\theta \\ 0 & 1 & 0 \\ s\theta & 0 & c\theta \end{bmatrix}$$



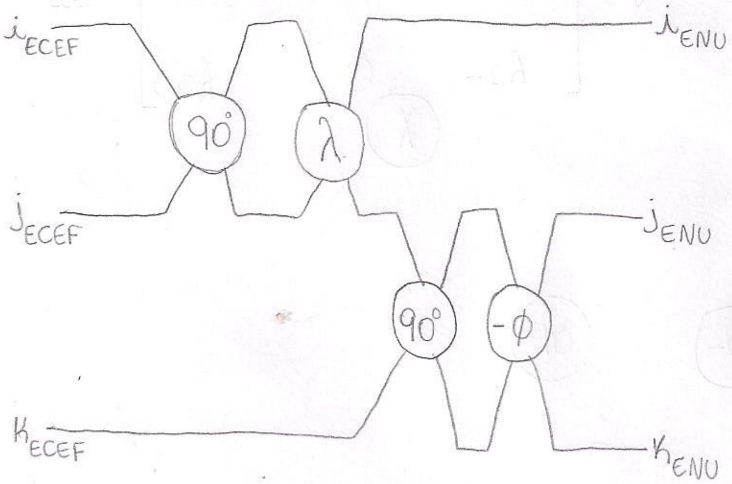
$$R_z(\psi) = \begin{bmatrix} c\psi & s\psi & 0 \\ -s\psi & c\psi & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Questão 9-



$$\Rightarrow D^{ECEF}_{NED} = \begin{bmatrix} -c\lambda s\phi & -s\lambda s\phi & c\phi \\ -s\lambda & c\lambda & 0 \\ -c\lambda c\phi & -s\lambda c\phi & -s\phi \end{bmatrix}$$

Questão 10-



$$\Rightarrow D^{ECEF}_{ENU} = \begin{bmatrix} -s\lambda & c\lambda & 0 \\ -c\lambda s\phi & -s\lambda s\phi & c\phi \\ c\lambda c\phi & s\lambda c\phi & s\phi \end{bmatrix}$$

Questão 7-

(LISTA 1)

$$D_b^{\omega} = \begin{bmatrix} c\alpha & 0 & -s\alpha \\ 0 & 1 & 0 \\ s\alpha & 0 & c\alpha \end{bmatrix} \begin{bmatrix} c\beta & -s\beta & 0 \\ s\beta & c\beta & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} c\alpha c\beta & -c\alpha s\beta & -s\alpha \\ s\beta & c\beta & 0 \\ s\alpha c\beta & -s\alpha s\beta & c\alpha \end{bmatrix}$$

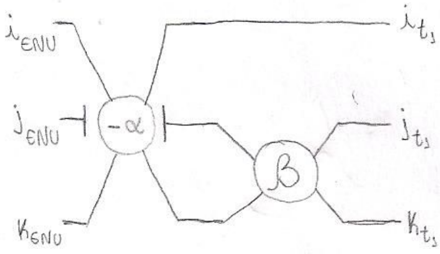
Questão 8-

$$\rightsquigarrow V_b = D_b^{\omega} V_{\omega} = D_b^{\omega} \begin{bmatrix} V_T \\ 0 \\ 0 \end{bmatrix} = V_T \begin{bmatrix} c\alpha c\beta \\ s\beta \\ s\alpha c\beta \end{bmatrix} = 100 \begin{bmatrix} \cos 10^\circ \cos 5^\circ \\ \operatorname{sen} 5^\circ \\ \operatorname{sen} 10^\circ \cos 5^\circ \end{bmatrix} = \begin{bmatrix} 98,106 \\ 8,7156 \\ 17,299 \end{bmatrix}$$

$$\rightsquigarrow V_{NED} = D_{NED}^{b} V_b = \begin{bmatrix} \cancel{\cos 90^\circ \cos 20^\circ} & \cancel{\cos 90^\circ \operatorname{sen} 20^\circ \operatorname{sen} 30^\circ} - \operatorname{sen} 90^\circ \cos 30^\circ & \cancel{\cos 90^\circ \operatorname{sen} 20^\circ \cos 30^\circ} + \operatorname{sen} 90^\circ \operatorname{sen} 30^\circ \\ \operatorname{sen} 90^\circ \cos 20^\circ & \operatorname{sen} 90^\circ \operatorname{sen} 20^\circ \operatorname{sen} 30^\circ + \cancel{\cos 90^\circ \cos 30^\circ} & \operatorname{sen} 90^\circ \operatorname{sen} 20^\circ \cos 30^\circ - \cancel{\cos 90^\circ \operatorname{sen} 30^\circ} \\ -\operatorname{sen} 20^\circ & \cos 20^\circ \operatorname{sen} 30^\circ & \cos 20^\circ \cos 30^\circ \end{bmatrix} \begin{bmatrix} 98,106 \\ 8,7156 \\ 17,299 \end{bmatrix} =$$

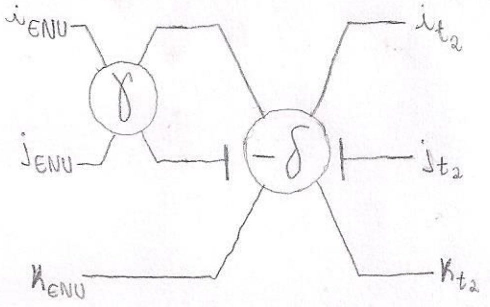
$$= \begin{bmatrix} 0 & -0,866 & 0,5 \\ 0,9397 & 0,171 & 0,2962 \\ -0,342 & 0,47 & 0,8138 \end{bmatrix} \begin{bmatrix} 98,106 \\ 8,7156 \\ 17,299 \end{bmatrix} = \begin{bmatrix} 1,1018 \\ 98,804 \\ -15,378 \end{bmatrix}$$

Questão 11-



$$\Rightarrow D_{ENU}^{t_1} = \begin{bmatrix} c\alpha & s\alpha s\beta & s\alpha c\beta \\ 0 & c\beta & -s\beta \\ -s\alpha & -c\alpha s\beta & c\alpha c\beta \end{bmatrix}; \quad \rightsquigarrow d_{t_1}^{1} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}; \quad \rightsquigarrow \alpha = 30^\circ, \ \beta = 45^\circ$$

$$\rightsquigarrow D_{ENU}^{t_1} d_{t_1}^{1} = \begin{bmatrix} s\alpha c\beta \\ -s\beta \\ c\alpha c\beta \end{bmatrix} = \begin{bmatrix} 0,3535 \\ -0,707 \\ 0,6124 \end{bmatrix}; \quad \rightsquigarrow D_{ENU}^{t_2} d_{t_2}^{2} = \begin{bmatrix} c\gamma c\delta \\ s\gamma c\delta \\ -s\delta \end{bmatrix} = \begin{bmatrix} 0,3535 \\ -0,707 \\ 0,6124 \end{bmatrix} \longrightarrow \delta = -37,76^\circ, \ \gamma = 63,43^\circ$$



$$\Rightarrow D_{ENU}^{t_2} = \begin{bmatrix} c\gamma c\delta & -s\gamma & c\gamma s\delta \\ s\gamma c\delta & c\gamma & s\gamma s\delta \\ -s\delta & 0 & c\delta \end{bmatrix}; \quad \rightsquigarrow d_{t_2}^{2} = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$$