EJERCICIO RECURSO SOLAR

$\varphi = -35°30' = -35,5°$ $\quad T_{UTC-3} = 10$

$L_0 = -55°15' = -55,25°$ $\quad n = 169$ (18/6)

1.) a) Ángulos posición Sol

$$\delta = \delta_0 \cdot \sin\left(2\pi \cdot \frac{(284+n)}{365}\right)$$

$$\delta = 23,45° \cdot \sin\left(2\pi \cdot \frac{284+169}{365}\right)$$

$$\boxed{\delta = 23,41°}$$

$$E = t_s - t_0 = f(\Gamma) \quad \Gamma = \frac{2\pi \cdot (n-1)}{365} = 2,89 \quad \Big\} \; E = -0,67 \text{ min.}$$

$$\omega = \left(\frac{t_{UTC} + \frac{E}{60} + \frac{L_0 - L_{UTC}}{15}}{12} - 1\right) \cdot \pi$$

(E: $-0,67$ min; L_0: $-55,25°$; L_{UTC}: $45°$)

$$\boxed{\omega = -40,42°}$$

$$\theta_z = A\cos\left(\sin\delta \cdot \sin\varphi + \cos\delta \cdot \cos\varphi \cdot \cos\omega\right)$$

(δ: $23,41°$; φ: $-35,5°$; δ: $23,41°$; φ: $-35,5°$; ω: $-40,42°$)

$$\boxed{\theta_z = 70,24°}$$

$$\alpha_s = 90° - \theta_z$$

$$\boxed{\alpha_s = 19,76°}$$

$$\gamma_s = \text{signo}(\omega) \cdot \left| \arccos\left(\frac{\sin\delta - \cos\theta_z \cdot \sin\varphi}{\sin\theta_z \cdot \cos\varphi} \right) \right|$$

(δ = 23,41°, φ = -35,5°, θ_z = 19,76°)

"negativo"

$$\boxed{\gamma_s = -39,21^\circ}$$

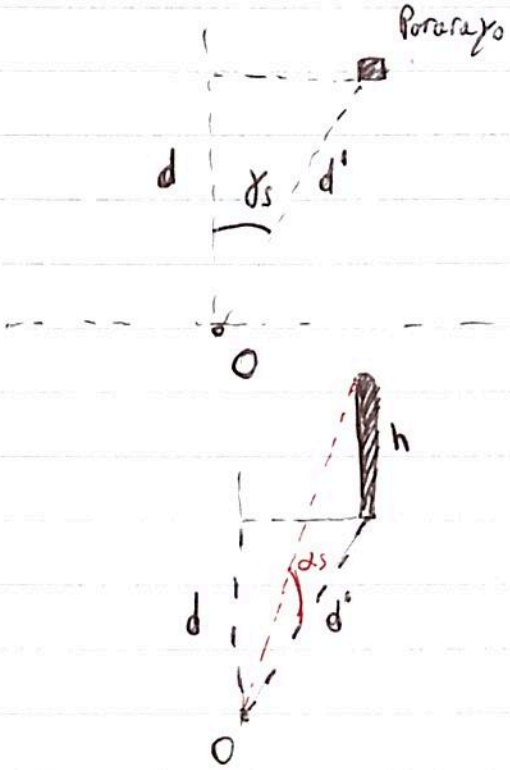
1) b) Calcular θ para seguimiento acimutal 35°

$$\cos\theta = \cos(\beta - \theta_z)$$

(β = 35°, θ_z = 19,76°)

$$\boxed{\theta = 35,24^\circ}$$

1) c) Distancia de pararayos al N, $d = 20\ m$



$$\cos\gamma_s = \frac{d}{d'} \Rightarrow d' = \frac{d}{\cos\gamma_s}$$

$$\tan\alpha_s = \frac{h}{d'} \Rightarrow h = d \cdot \frac{\tan\alpha_s}{\cos\gamma_s}$$

$$h = 20\ m \cdot \frac{\tan(19,76^\circ)}{\cos(-39,21^\circ)}$$

$$\boxed{h = 9,28\ m}$$

2) a) ¿ f_d ? $G_h = 300\ W/m^2$

$f_d = f(K_T)$

$K_T = \dfrac{G_h}{G_{oh}}$

$G_{oh} = G_{os} \cdot F_n \cdot \cos\theta_z$ ($G_{os} = 1367\ W/m^2$, $\theta_z = 70{,}24°$)

$F_n = f(n) = 1{,}033 \cos\left(\dfrac{2\pi \cdot n}{365}\right) \Rightarrow F_n = 0{,}97$

$\Rightarrow G_{oh} = 447{,}48\ W/m^2$

$K_T = \dfrac{300\ W/m^2}{447{,}48\ W/m^2} = 0{,}67$

$f_d = f(K_T) = a_0 + a_1 \cdot e^{(a_2 + a_3 \cdot K_T)}$

$\begin{bmatrix} a_0 = 0{,}97 \\ a_1 = -1{,}01 \\ a_2 = 3{,}07 \\ a_3 = -6{,}17 \end{bmatrix}$

$\boxed{f_d = 0{,}25}$

2) b) $f_g = 0{,}2$ ¿ G_{gi} ?

$G_{gi} = G_{bi} + G_{di} + G_{ri}$

$G_{bi} = r_b \cdot G_{bh} = \dfrac{\cos\theta}{\cos\theta_z} \cdot (1 - f_d) \cdot G_h$ ($\theta = 35{,}23°$, $\theta_z = 70{,}23°$, $f_d = 0{,}25$, $G_h = 300\ W/m^2$)

$\boxed{G_{bi} = 540{,}37\ W/m^2}$ $\qquad$ $\boxed{r_b = 2{,}42}$

$$G_{di}^{HD} = G_{di-cs} + G_{di-iso}$$

$$T_b = (1 - f_d) \cdot K_t \quad (f_d = 0{,}25,\ K_t = 0{,}67) \Rightarrow \boxed{T_b = 0{,}5}$$

$$G_{di}^{HD} = G_{dh} \cdot \left(T_b \cdot F_b + (1 - T_b) \cdot \left(\frac{1 + \cos\beta}{2} \right) \right) \quad (T_b = 0{,}5;\ F_b = 2{,}42;\ \beta = 35°)$$

$G_{dh} = 0{,}25 \cdot 300\ W/m^2$

$$\boxed{G_{di}^{HD} = 116{,}76\ W/m^2}$$

$$G_{ri} = \left(\frac{1 - \cos\beta}{2} \right) \cdot \rho_g \cdot G_h \quad (\beta = 35°;\ \rho_g = 0{,}2;\ G_h = 300\ W/m^2)$$

$$\boxed{G_{ri} = 5{,}43\ W/m^2}$$

$$G_{gi} = G_{bi} + G_{di}^{HD} + G_{ri} \Rightarrow \boxed{G_{gi} = 672.55\ W/m^2}$$