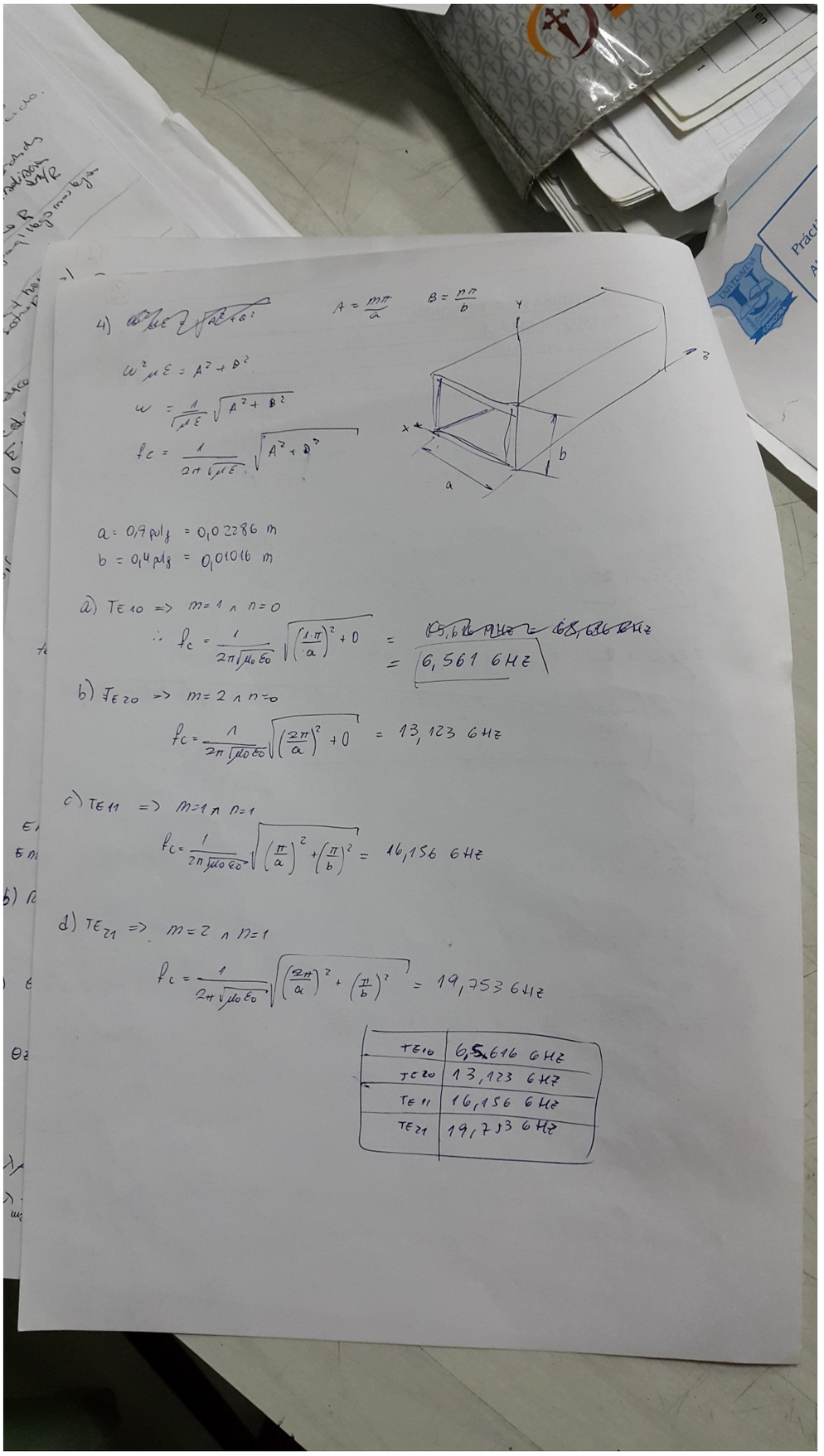
4)
$A = \frac{m\pi}{a}$
$B = \frac{n\pi}{b}$
$\omega^2 \mu\varepsilon = A^2 + B^2$
$\omega = \frac{1}{\sqrt{\mu\varepsilon}} \sqrt{A^2 + B^2}$
$f_c = \frac{1}{2\pi\sqrt{\mu\varepsilon}} \sqrt{A^2 + B^2}$
y
z
x
b
a
$a = 0{,}9\,\text{palg} = 0{,}02286\ \text{m}$
$b = 0{,}4\,\text{palg} = 0{,}01016\ \text{m}$
a) $TE_{10} \Rightarrow m = 1 \wedge n = 0$
$\therefore f_c = \frac{1}{2\pi\sqrt{\mu_0 \varepsilon_0}} \sqrt{\left(\frac{1\cdot\pi}{a}\right)^2 + 0} = 6{,}561\ \text{GHz}$
b) $TE_{20} \Rightarrow m = 2 \wedge n = 0$
$f_c = \frac{1}{2\pi\sqrt{\mu_0 \varepsilon_0}} \sqrt{\left(\frac{2\pi}{a}\right)^2 + 0} = 13{,}123\ \text{GHz}$
c) $TE_{11} \Rightarrow m = 1 \wedge n = 1$
$f_c = \frac{1}{2\pi\sqrt{\mu_0 \varepsilon_0}} \sqrt{\left(\frac{\pi}{a}\right)^2 + \left(\frac{\pi}{b}\right)^2} = 16{,}156\ \text{GHz}$
d) $TE_{21} \Rightarrow m = 2 \wedge n = 1$
$f_c = \frac{1}{2\pi\sqrt{\mu_0 \varepsilon_0}} \sqrt{\left(\frac{2\pi}{a}\right)^2 + \left(\frac{\pi}{b}\right)^2} = 19{,}753\ \text{GHz}$
TE_{10} 6,561 GHz
TE_{20} 13,123 GHz
TE_{11} 16,156 GHz
TE_{21} 19,753 GHz