Homework 4 (back before Midterm)

The S-parameters of an active two-port network (GaN power HEMT) measured at 10 GHz are given below ($Z_0$ at both ports is 50 $\Omega$)

1. Is this network lossless, reciprocal?
2. Calculate the input impedance if the 2$^{nd}$ port is loaded by 10-j20 Ohm.
3. Design a microstrip matching network (using series line and open shunt stub) to 50 $\Omega$ for this input impedance using Smith chart, calculate the length and width of the microstrip lines for alumina board with $\varepsilon_r$=9.8 and thickness $d$=0.127 cm (assume other parameters ideal).
4. Calculate the input impedance if the 2$^{nd}$ port is loaded by 100+j50 Ohm. Is it still possible to use lossless matching network to match this impedance

\[
S = \begin{bmatrix}
0.75 - j0.4 & -0.04 + j0.04 \\
-6 + j & 0.65 - j0.2
\end{bmatrix}
\]

\[Z_\text{in} = 10 - j20 \Omega\]