Microwave CAD and Measurements, Mid-Term. Exam.

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PIN = *abcd*: 휴대전화 끝 4 자리 (예: 010-8028-3194, a = 3, b = 1, c = 9, d = 4), 단 각 숫자가 0인 경우 순차적으로 1, 2, 3, 4로 대체 (예: 010-1234-0097인 경우 a = 1, b = 2, c = 9, d = 7)

배점: 소문제당 10점

1. Given a transmission line with L = (100a + 10b + c) nH/m, C = (10d + a) pF/m, R = 0, G = 0, f = (1000b + 200c+30d) MHz, calculate

1) the characteristica impedance Z_0 (Ω),

2) the attenuation constant □(Np/m), and

3) the phase constant □(rad/m).

2. Write a Python code to find

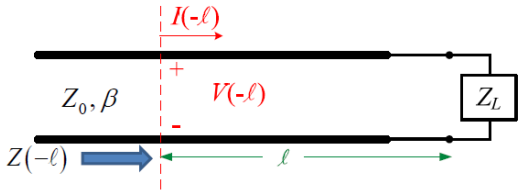
1) the characteristica impedance Z_0 (Ω) and

2) the complex propagation constant □(/m)

for a transmission line with L = (100a + 10b + c) nH/m, C = (10d + a) pF/m, R = (100c + 10b + a) mΩ/m, G = 10d μΩ/m, f = (1000b + 200c+30d) MHz. Submit the source code and a sample of a code execution.

3. Design an air-filled parallel-plate transmission line with a characteristic impedance of 20a Ω. Use a perfect electric conductor (PEC) material. Use □= ∞ for PEC and □= 1 for air.

4. A load Z_L at z = 0 is connected with a tranmision line of length l with Z_0 and □with Z_L = 10(a + jc) Ω, Z_0 = 20d Ω, l = 0.1b wavelength (tranmssion line length).



Find

1) the load reflection coefficient $\Gamma_L = \Gamma(0)$,

2) the input reflection coefficient $\Gamma(-l)$,

3) the input impedance $Z(-l)$ (Ω), and

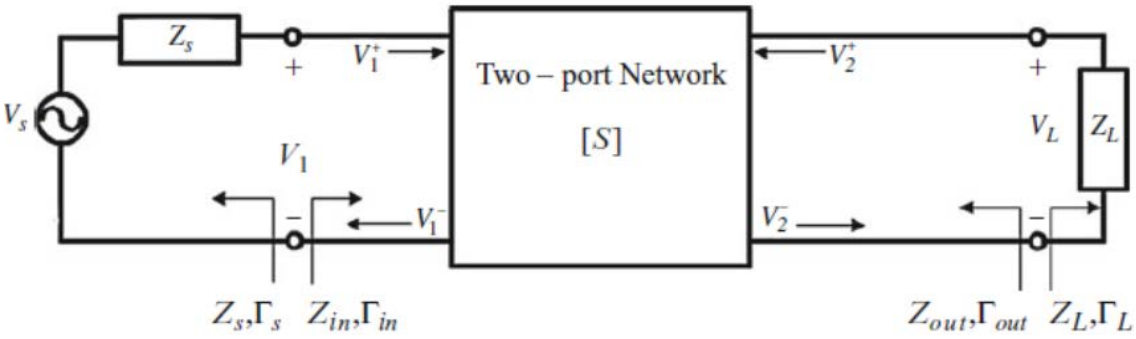
4) the power delivered to the load when a power of 1 watt is incident on the transmissio line at $z = -l$.

5. Draw on a Smith chart

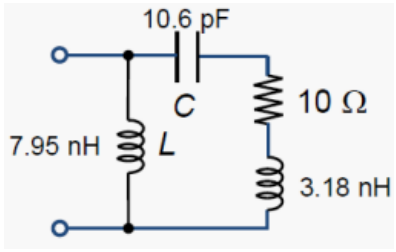
1) an $r = d/10$ circle, and.

2) an $x = b/5$ circle.

6. Write a Python code for calculating Γ_{in} and Γ_{out} of a two-port network shown below. Submit the source code and a sample of a code execution.



7. Write a Python code for calculating input impedance Z_{in} (Ω) and the input reflection coeffcientΓ_{in} (dB) of the circuit shown below with a reference impedance Z_0 of 20c Ω at 10b MHz frequency interval between 200 MHz and 800 MHz.



8. A load impedance $Z_L = 30a - j30b$ Ω is to be transformed to $Z_{in} = Z_0 = 20d$ Ω at 100b MHz.

1) Use a Python code given in the lecture webpage to find all possible *LC* matching networks. Submit the source code and the result of your program execution by capturing the PC screen.

2) Draw all of your matching networks.