Microwave CAD and Measurements, Final Exam. Problems

학번 () 성명 () 이동전화번호 () 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)

The impeance of the following circuit is Z_2 . Element values: C = 10a (nF), $L_S = 100b$ (pH), $R_S = d/10$ (Ω), $R_D = c$ (G Ω). Neglect C_P .



1. (10점) Find the self-resonant frequency f_r (Hz) of the circuit in Fig. 1. (10 points)

2. (20점) At the self-resonant frequency, calculate Z_2 and $Z_1 = 1/(\square_C)$.

The impeance of the following circuit is Z_2 . C = 0.1a pF, R = b ohm, L = c + 0.1d uH



Fig. 2 Inductor equivalent circuit

- 3. (10점) Find the self-resonant frequency f_r (Hz) of the circuit in Fig. 2
- 4. (20점) At the self-resonant frequency, calculate Z_2 and $Z_1 = i \Box_L$.
- 5. (30^A) Write a Python code for calculating Z_2 and calculate Z_2 at $f = 0.1 f_r$, $0.5 f_r$, $1.0 f_r$, $2 f_r$, and $10 f_r$.
- 6. (20점) For a planewave propagating in +z direction in a medium with $\Box = a$ and $\mu_r = c$, f = b (GHz),
 - $\mathbf{E} = (E_x, E_y, E_z) = (0, d, 0) \text{ V/m}$
- 1) find the wavelength \Box (m),
- 2) find $\mathbf{H} = (H_x, H_y, H_z) = (, ,) \text{ A/m}$
- 7. (20점) A planewave is incident from medium 1 to medium 2 with the incident electric field parallel to the plane of incidence. The angle of incidence is 45°.

Medium 1: $\Box = {}_{b}\Box , \mu_{1} = d\mu_{0}$ Medium 2: $\Box = {}_{c}\Box , \mu_{2} = a\mu_{0}$

Find the reflection coefficient Γ and the transmission coefficient \Box