

所別：電機工程學系碩士班 乙組 科目：電磁學

1. (20%) A coaxial transmission line has thin hollow inner and outer conductors of radius  $a$  and  $b$ , respectively. The dielectric medium ( $\epsilon, \mu, \sigma$ ) fills the space between both conductors. (a) Draw the equivalent circuit of the line of differential length ( $\Delta z$ ). (b) Derive the expressions for the four distributed parameters, R, L, G, and C.
2. (20%) State how to use Smith Chart to obtain admittances. When describing each step, please also explain the corresponding reason in details.
3. (20%) Determine the condition under which the magnitude of the reflection coefficient equals that of the transmission coefficient for a uniform plane wave at normal incident on an interface between two lossless dielectric media. What is the standing-wave ratio in dB under this condition?
4. (20%) The inner dimensions of an air-filled rectangular waveguides suitable for X-band applications are  $a=2.29\text{cm}$  and  $b=1.02\text{cm}$ . If it is desired that the waveguide operates only in the dominant  $\text{TE}_{10}$  mode and that the operating frequency be at least 25% above the cutoff frequency of the  $\text{TE}_{10}$  mode but no higher than 95% of the next higher cutoff frequency. What is the allowable operating-frequency range? Also, why is it impractical if the range of operating frequency begins at 0.5% above the cutoff frequency?
5. (20%) Explain the following phenomena: (a) dielectric breakdown, and (b) curie temperature.

