國立成功大學 107 學年度碩士班招生考試試題

系　　所：電腦與通信工程研究所

考試科目：電磁波

考試日期：0205，節次：2

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

Problem 1 (20 Points)

In free space, the magnetic field intensity $\bar{H} = \cos(\omega t + \beta x)\hat{a}_y$ A/m. *Directly from the differential form of Maxwell's equations*, find the associate (a) electric field intensity, and (b) prove that $\beta / \omega = \sqrt{\mu_0 \varepsilon_0}$, where ε_0 and μ_0 are the permittivity and permeability of air, respectively.

Problem 2 (10 Points)

Draw the *electric fields*, *magnetic fields*, and *Poynting vectors* around the circuit at the points $A \sim H$ shown in the figure.

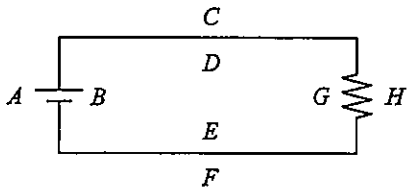


Figure for Problem 2

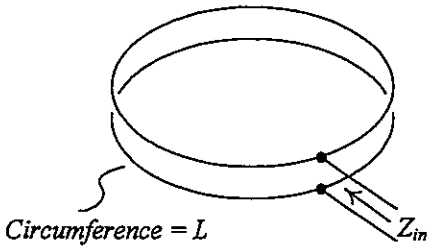


Figure for Problem 3

Problem 3 (10 Points)

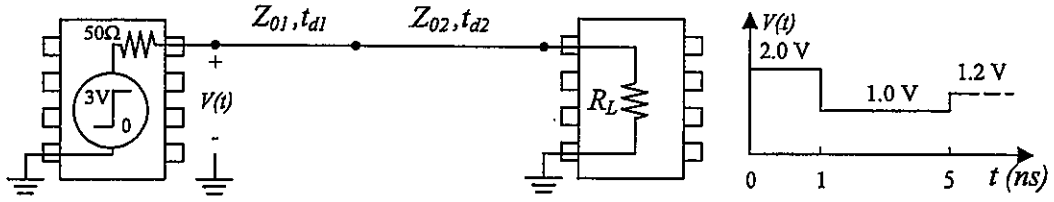
A length L of two-wire transmission line (of characteristic impedance Z_0 and wave number β) is bent into a loop by connecting its ends together as shown. Find an expression for the input impedance Z_{in} looking into the connection terminals. (Hint: use the symmetry of the circuit).

Problem 4: (20 Points)

A 20 by 10 *mm* air-filled waveguide is required to introduce a signal *group delay* of 5 μs at 10 GHz using its fundamental mode. What are (a) the total wave number, (b) the wave number in the propagation direction, (c) the phase velocity, (d) the group velocity, and (e) the required waveguide length in *meters*?

Problem 5 (20 Points)

Two *ICs* are connected together with two sections of transmission lines. The voltage at the output of the driver *IC* is as shown in the figure. Find the characteristic impedance (Z_{01} and Z_{02}) and time delays (t_{d1} and t_{d2}) of both lines, and the unknown load R_L.



Problem 6 (20 Points)

You MUST use the Smith chart on next page to find all the answers in this problem. Using any other methods to find the results give you **zero** point.

On your answer sheet, please write down and explain every step of your reasoning, and sketch the results on simplified Smith charts when needed.

A transmission line section has a characteristic impedance of 1 ohm and a length of $\lambda/8$. It is terminated at one end by an unknown load Z_L. If it is measured from the other end of the line, it is at the point A of a Smith impedance chart, as shown on next page. What are (a) the impedance at point A, (b) the reflection coefficient at the point A? (c) the impedance Z_L, (d) the admittance Y_L, and (e) the VSWR on the line?

Again, don't use any formula. Otherwise you get no point.

編號： 197

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