

※ 考生請注意：本試題  可  不可 使用計算機

**Problem 1 (20 Points)**

Prove that the four Maxwell's equations are not totally independent.

**Problem 2 (20 Points)**

Draw the electric fields, magnetic fields, and Poynting vectors around the circuit shown in the figure (at the points A to H).

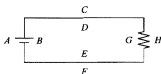


Figure for Problem 2

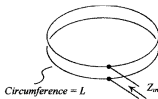


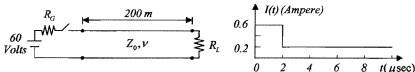
Figure for Problem 3

**Problem 3 (20 Points)**

A length  $L$  of two-wire transmission line (of characteristic impedance  $Z_c$  and wave number  $\beta$ ) is bent into a loop by connecting its ends together as shown. Find an expression for the input impedance  $Z_m$  seen looking into the connection terminals.

**Problem 4 (20 Points)**

After closing the switch at  $t = 0$  in the transmission line circuit shown, the current  $I(t)$  is found by measurement to be as shown. Determine the wave velocity  $v$  and characteristic impedance  $Z_o$  of the transmission line, and the value of  $R_G$  and  $R_L$ .



**Problem 5 (20 Points)**

A metallic, water-filled ( $\epsilon_r=81$ ), rectangular waveguide has the inner dimensions of 1cm by 3cm. (a) What is the cutoff frequency of the lowest propagating mode? (b) If only one mode is allowed to propagate, what is the bandwidth of this waveguide?