THE INTERNATINONAL UNIVERSITY (IU) – VIETNAM NATIONAL UNIVERSITY – HCMC

Final Examination

Date: June 9th , 2011

Duration: 120 minutes

SUBJECT: Electromagnetic Theory	
Dean of School of Electronics & Telecommunications Engineering Signature: Full name:	Lecturer: Tran Van Su, M.Eng. Signature: Full name:

INTRODUCTIONS:

1. This is a closed-book examination
2. One sheet of notes allowed during examination period.
3. Communications devices are prohibited
4. Answer all questions

Question 1 (25 Marks)

The time variation for z = 0 of a function f(z,t) representing a traveling wave propagating in the +z-direction with velocity 150 m/s is shown in Fig. 1. Find the value of the function for each of the following case:

a) z = 300m, t = 2.5s **(15 Marks)**

b) z = -150m, t = 0.5s **(10 Marks)**

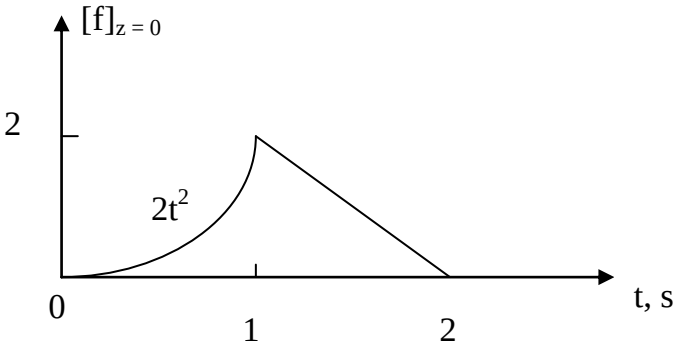

Fig. 1

Question 2 (25 Marks)

Two sinusoidally time-varying, linear vector fields are given at a point by

$$\vec{F}_1 = \left(C\hat{x} + C\hat{y} + \hat{z}\right)\cos 2\pi \times 10^6 t$$
$$\vec{F}_2 = \left(C\hat{x} + \hat{y} - 2\hat{z}\right)\sin 2\pi \times 10^6 t$$

where C is a constant

a) Determine the polarization of vector $\vec{F}_1 + \vec{F}_2$ for C = 2 **(10 Marks)**

(Hint: 1. Are $\mathbf{F_1}$ and $\mathbf{F_2}$ in phase? Are $\mathbf{F_1}$ and $\mathbf{F_2}$ opposite phase? is $\mathbf{F_1}$ perpendicular to $\mathbf{F_2}$)

b) Find the values of C for which the tip of the vector $\vec{F}_1 + \vec{F}_2$ traces a circle with time **(15 Marks)**

(Hint: (i) Compute the modulus of $\vec{F}_1 + \vec{F}_2$ and determine c to obtain constant magnitude (ii) Check 3 conditions for circular polarization)

Question 3 (25 Marks)

The plane z = 0 forms the boundary between free space (z > 0) and another medium.

a) Write four equations of boundary conditions **(5 Marks)**

b) Find $\vec{J}_S(0,0,0)$ at t = 0 if z < 0 is a perfect conductor and $\vec{H}(0,0,0^+) = H_0(3\hat{x} - 4\hat{y})\cos\omega t$. **(10 Marks)**

c) Find $\vec{H}(0,0,0^+)$ at t = 0 if z < 0 is a magnetic material of $\mu = 20\mu_0$ and $\vec{H}(0,0,0^-) = H_0(10\hat{x} + \hat{z})\cos\omega t$. **(10 Marks)**

Question 4 (25 Marks)

For the transmission line of the following Figure

a. Calculate and sketch the bounce diagram of voltages for 0 < t < 5μs. **(5 Marks)**

b. Calculate and sketch the bounce diagram of currents for 0 < t < 5μs. **(5 Marks)**

c. Determine V_{SS} and I_{SS} **(5 Marks)**

d. Determine V^+_{SS} and I^+_{SS} **(5 Marks)**

e. If R_L is substituted by a capacitor C, compute the voltage reflection coefficient at the capacitor for t = 1μs and t → ∞ **(5 Marks)**