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

Final Examination

Date: June 21, 2018

Duration: 120 minutes

SUBJECT: Electromagnetic Theory	
Dean of School of Electrical Engineering Signature: Full name: Tran Van Su	Lecturer Signature: Full name: Tran Van Su

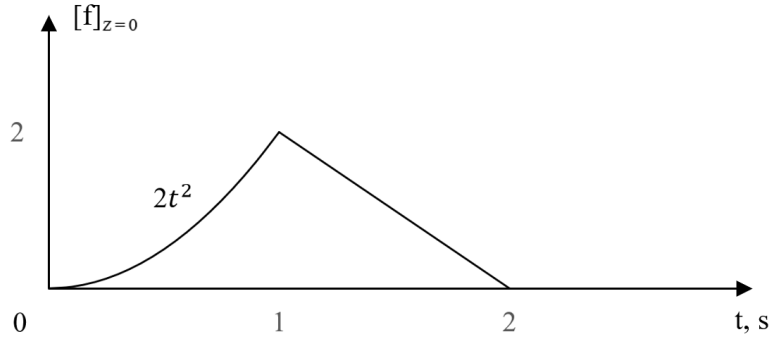
INTRODUCTIONS:

1. One sheet, A4-size paper, with your own hand-writing characters is allowed (Books are prohibited)
2. Laptop and communications devices are not allowed except calculators
3. Answer all questions

Question 1 (20 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 *Figure* below. Find the value of the function for each of the following case:

a) z = 300m, t = 2.5s **(10 Marks)**
b) z = -150m, t = 0.5s **(10 Marks)**



Question 2 (15 Marks)

The magnetic field of a uniform plane wave in free space is given by:

$$\vec{H} = H_0 \cos(6\pi \times 10^8 t + 2\pi y)\,\hat{x}$$

Find unit vectors along the following:

a) the direction of propagation of the wave **(5 Marks)**
b) the direction of the magnetic field at t = 0, y = 0 **(5 Marks)**
c) the direction of the electric field at t = 0, y = 0 **(5 Marks)**

Question 3 (20 Marks)

For each of the following values of the displacement flux density at a point on the surface of a perfect conductor (no electric field inside and hence $E_t = 0$ on the surface), find the surface charge density at points:

a) $\vec{D} = D_o\,(\hat{x} + 2\hat{y} + 2\hat{z})$ and pointing away from the surface **(10 Marks)**
b) $\vec{D} = D_o\,(\hat{x} + \sqrt{3}\,\hat{z})$ and pointing toward the surface **(5 Marks)**
c) If the surface charge density at a point on the surface is zero, find D_0 **(5 Marks)**

Assume D_0 to be positive for questions *a* and *b*

Question 4 (20 Marks)

A lossy dielectric (with $\mu = \mu_o$) has an intrinsic impedance $200\angle 30^\circ$ (Ω) at a particular radian frequency ω. If, at that frequency, the plane wave propagating through the dielectric has the magnetic components

$$\vec{H} = 10e^{-\alpha x}\cos\left(\omega t - \frac{1}{2}x\right)\hat{y}\ \text{(A/m)}$$

a) Determine the direction of electric field and propagation constant β **(5 Marks)**
b) Write the expression of the electric field **(15 Marks)**

Question 5 (25 Marks)

For the Transmission line of the following *Figure*

a) Calculate and sketch the bounce diagram of the voltages for $0 < t < 6\mu s$ **(10 Marks)**
b) Calculate and sketch the bounce diagram of the currents for $0 < t < 6\mu s$ **(10 Marks)**
c) Sketch the current versus time at two ends of Transmission line for $0 < t < 6\mu s$ **(5 Marks)**