Prof. Yen-Chieh Huang *office: Delta 856*
Dept of Electrical Engineering *ext: 62340*
National Tsing-Hua University *email:ychuang@ee.nthu.edu.tw*

EE214000 Electromagnetics, Fall 2020

Your name: _____ ID: _____ Jan. 3rd, 2021

Announcements for the final exam:

1. The exam is scheduled at 10:10 am on Monday June 11th, open books & open notes.
2. The scope of the exam is up to Lec. 18.2, covering materials before the midterm exam.
3. You can bring into the classroom your notebook computer, pad, cell phone, calculators etc.

EE214000 Electromagnetics, Fall, 2020
Quiz #17-1, Open books, notes (20 points), due 11 pm, Wednesday, Jan. 6th, 2021
(submission through iLMS)

Late submission won't be accepted!

1. Describe how a cordless charger charges a cell phone, Apple watch, toothbrush etc.? To explain, draw a circuit including two parts, the charger and the appliance. (3+3 points)

CHOETECH Wireless Charger 2 Pack, Wireless Charger 7.5W Wireless Charging Stand for iPhone 12/12 Pro / 11/11 Pro / XS Max / XR ...
★★★★½ ~ 988

Hinyx Wireless charging mat, wireless charging station for iWatch 5/4/3, Airpods 2 / Pro, fast wireless charging pad for iPhone SE / 11/11 Pro / XR /...
★★★★☆ ~ 771

*Images extracted from MOMO and Amazon websites.

2. Write down the 4 Maxwell's Equations, in both differential and integral forms. Also, list the Lorentz Equation and Equation of continuity. Define all the symbols in the expressions. (6 points)

3. Explain why a time-varying magnetic field can't exist in a perfect conductor? (3 points)

4. Explain why $\vec{A}(R,t)=\frac{\mu}{4\pi}\int_{V'}\frac{\vec{J}(t-\sqrt{\mu\varepsilon}R)}{R}dv'$, and $V(R,t)=\frac{1}{4\pi\varepsilon}\int_{V'}\frac{\rho(t-\sqrt{\mu\varepsilon}R)}{R}dv'$ describe the ***retarded*** electromagnetic potentials. In other words, if at time t' your power supply induces time-varying charge $\rho(t')$ and $\vec{J}(t')$ in an antenna, when do you expect that someone would measure $\vec{A}$ and V at a distance R from the antenna? (5 points)