PRACTICE FINAL EXAM SOLUTION

PROBLEM #1

SEE EXAM 1 SOLUTIONS

PROBLEM #2

$$\vec{E} = \frac{\sigma}{2\epsilon_0}$$

$$\boxed{F = Q\vec{E} = \frac{Q\sigma}{2\epsilon_0}}$$

PROBLEM #3

a) $\vec{F} = q\vec{E}$

b) $ma = qE$

$$a = \frac{qE}{m}$$

$$\boxed{x(t) = \frac{qE}{m}\,\frac{1}{2}t^2}$$

c) $100\ eV = 1.6 \times 10^{-17}\ J = \frac{1}{2}mv^2$

$$\frac{3.2 \times 10^{-17}}{9.109 \times 10^{-31}} = v^2$$

NOTE: MASS OF ELECTRON

eV

v = JUST CALCULATE ABOVE.

DO NOT MEMORIZE

WE'LL GIVE THESE OUT ON EXAM

PROBLEM # 4

AMPERE'S LAW

OUTSIDE WIRE

$$2\pi r B = \mu_0 I.$$

$$B = \frac{\mu_0 I}{2\pi r}$$

INSIDE

$$2\pi r B = \mu_0 I_0 \frac{r^2}{a^2}$$

$$B = \mu_0 I \frac{r}{2\pi a^2}$$

PROBLEM 5

$$\mathcal{E} = -L\frac{dI}{dt} = -N\frac{d\Phi_B}{dt}$$

$$\Phi_B = BA$$

$$B = \mu_0 \frac{N}{\ell} I$$

$$\mathcal{E} = -L\frac{dI}{dt} = -N\frac{\mu_0 N A}{\ell}\frac{dI}{dt}$$

$$\boxed{L = \frac{\mu_0 N^2 A}{\ell}}$$

PROBLEM 6

a) $\mathcal{Z}_T = R + i\omega L$

b) $\phi = \tan^{-1}\frac{\omega L}{R}$