Week 3 Questions and Answer Key

- Day 1, Review
- Day 2, Test
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1. If the current in a $1\mu F$ capacitor is to be $0.1mA$, at what rate in volts per second must the applied voltage change? $\frac{dy}{dx} = 6x^2 + 2x$

2. The magnetic flux through a 500-turn winding varied according to $\phi = 0.004t$ webers. Find the induced voltage in the winding (a.) when $t = 0.01$ seconds and (b.) when $t = 0.1$ seconds. $v_{ind} = -2v$

3. If the flux through a 150-turn winding varied according to the formula $\phi = 0.01t - t^2 + 0.2$ webers, what voltage was induced when $t = 0.02$ seconds? $v_{ind} = 4.5v$

4. The magnetic flux N in a winding of 600 turns varied as $\phi = 0.5t^{\frac{3}{5}}$ webers, where t was in seconds. Find the induced voltage v_{ind} when $t = 1$ second. $v_{ind} = -180v$

5. What formula expresses the voltage v_{ind} across a $100mh$ inductor if the current i constantly equals $0.2A$? Neglect resistance. $v_{ind} = 0v$

6. How fast does the current in a $12h$ winding change to cause an induced voltage of $3.6v$? $\frac{di}{dt} = -300mA/sec$

7. The mutual inductance between two windings is 0.2 henrys. If a current $i_1 = 11t^{\frac{3}{2}}$ amps flows in the primary windings, how much voltage v_2 is induced in the secondary winding when $t = 0.001$ seconds? $v_2 = -104.355mV$

8. The mutual inductance between two windings is $M = 6h$. How fast must the current in one of the windings vary in amps per second to induce -4.8 volts in the other winding? $\frac{di}{dt} = 800mA/sec$

9. A winding linked a magnetic field that varied according to $\phi = 0.002t - 2t^2$ webers. When t was 0.0025 seconds, the voltage induced in the winding measured 8 volts. How many turns did the winding include? $N = 1000$ turns

10. If the current in a $30h$ inductor changes according to $i = 0.02t^{\frac{5}{3}}$ amps, after what interval will the induced voltage measure -96 volts? $t = 940.604$ seconds

11. A voltage, $v = t^3 + 1,000$ volts appears across a parallel RC combination, where $R = 300K\Omega$ and $C = 20\mu F$. Find the resulting current i_g at any time t.
$i_g = 3.333 \times 10^{-6}t^3 + 60 \times 10^{-6}t^2 + 3.333 \times 10^{-3}$ amps

12. A $50K\Omega$ bleeder resistor shunts a $4\mu f$ filter capacitor. During a part of the charging process, the voltage across the capacitor varies approximately as $vc = 1,000t^{\frac{2}{3}} + 100$ volts. Find the current ig applied to the combination when $t = 0.001$ seconds.
$ig = 28.867mA$

13. A current $i = 3t^{\frac{1}{3}} + 2$ amps flows through a series RL circuit, where $R = 100\Omega and L = 20h$. Find the voltage vg across this circuit when $t = 0.125$ seconds. $vg = 270v$