| ***Student Number:*** | EEE101 |
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## EEE101 – Circuits and Signals - Interim Test 2008

***Answer All Questions by writing the answer clearly in the appropriate box provided – <u>you do not need to show working on this sheet</u>***

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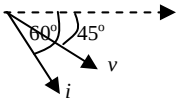
| 1 | Which ***<u>one</u>*** of the following statements is correct?<br>**A –** Energy is ***dissipated*** in an ideal inductor through the magnetic field<br>**B** – Energy is ***stored*** in an ideal capacitor through the magnetic field<br>**C** – Energy is ***dissipated*** in a resistor due to the current flow<br>**D** – Energy is ***stored*** in a resistor due to the applied voltage | C |
| 2 | From the definition of voltage, what is the ***energy gained*** in Joules by 1 electron when moving between two points with a potential difference of 10 volts? (charge on an electron = $1.6 \times 10^{-19}$ C) | Energy gained = volt drop x charge = $10 \times 1.6 \times 10^{-19}$ = **$1.6 \times 10^{-18}$ J** |
| 3 | A 12 V source is applied to a 6 Ω resistor. What is the ***total charge*** flow in a 0.5 second period? | $I$ = 12/6 = 2A, charge = 2 x 0.5 = **1C** |
| 4 | The voltage across a capacitor is observed to increase linearly with time. Under these conditions, the charging current is:<br>**A** – linearly increasing with time<br>**B** – linearly decreasing with time<br>**C** – constant with time<br>**D** – zero<br>Which ***<u>one</u>*** of these is correct? | C |
| 5 | Two capacitors of value 5 μF and 10 μF are connected in parallel to a DC supply. Which ***<u>one</u>*** of the following statements is correct?<br>**A** – the charge on each capacitor is the same<br>**B** – the 10 μF capacitor holds twice the charge of the 5 μF capacitor<br>**C** – the voltage on the 10 μF capacitor is twice that on the 5 μF capacitor<br>**D** – the voltage and charge are the same for each capacitor | B |
| 6 | Calculate the ***induced voltage*** across a 1 H inductor if the current passing through it is linearly reduced at a rate of 10 A in 1 ms. | $V = Ldi/dt$ =1x $(10/10^{-3})$ = **$10^4$ V** |
| 7 | A particular circuit draws a current of $i$=10sin(314$t$ - 60°) when driven by a voltage of $v$=50sin(314$t$ - π/4). What is the ***phase angle*** between the current and voltage? |  <br>$\alpha$ = 60-45 = **15°** |
| 8 | What is the ***magnitude of the impedance*** of the circuit of Q7? | \|Z\| = ***V/I*** = 50/10 = **5 Ω** |
| 9 | What is the ***power dissipated*** in the circuit of Q7? | P= $V_{rms}$ x $I_{rms}$ cos $\alpha$<br>= [(50 x 10)/2] cos15°<br>= **241 W** |

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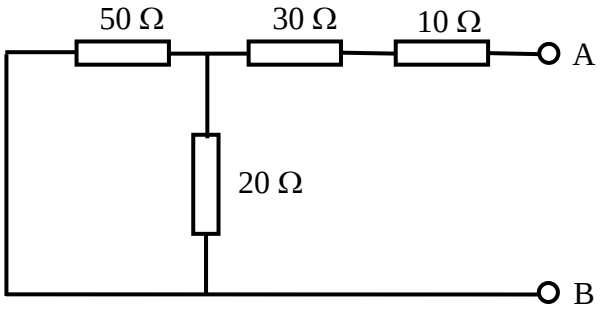
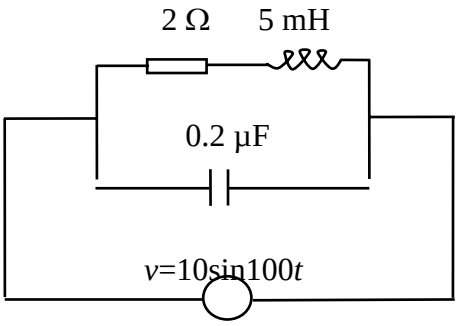
| 10 | An AC voltage source is applied to *L*, *C*, and *R* components connected in series. The impedances at the source frequency are 12 Ω, 10 Ω and 5 Ω respectively. Decide on which ***one*** of the following is a true statement (hint - use a phasor diagram):<br>**A** – The applied voltage leads the current<br>**B** – The applied voltage lags the current<br>**D** – The current and voltage are in phase | A |
| 11 | Find the ***equivalent resistance*** between A and B of the circuit given below.<br>  | $R_{AB}$ = 10+30+(50//20)<br>= 40+(20x50)/(20+50)<br>= 40 + 14.3<br>= **54.3 Ω** |
| 12 | Calculate the peak current flowing in the capacitor of the circuit illustrated below.<br>  | $X_C = 1/\omega C$<br>$= 1/(100x0.2x10^{-6})$<br>$= 5x10^4\ \Omega$<br>$\boldsymbol{I} = V/X_C$<br>$= 10/5x10^4$<br>$= \mathbf{2x10^{-4}\ A}$ |

Examiner Use Only:

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