1. Write the KCL equation at node 1 as shown.

2. Write the equation for the current flowing through the resistor $R_z$.

3. Write the equation for the current flowing through the inductor $L_1$ in the time domain, i.e., as a function of time.

4. Write the equation for the current flowing through the capacitor $C_a$ in the time domain, i.e., as a function of time.

5. What is the voltage at node A?

6. For the following circuit find the Thevenin’s equivalent circuit across A-A’.
7. What is the Norton equivalent for the circuit in Problem 6.

8. a). What are the values of the inductor voltage and current and the capacitor voltage and current assuming the switch has been closed for a very long time.

\[ V_L = \]
\[ I_L = \]
\[ V_C = \]
\[ I_C = \]

b). What are the values of the inductor voltage and current and the capacitor voltage and current at the instant the switch is opened.

\[ V_L = \]
\[ I_L = \]
\[ V_C = \]
\[ I_C = \]

9. Indicate if you are familiar with the following terms.

<table>
<thead>
<tr>
<th>Term</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero</td>
<td></td>
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<tr>
<td>Natural response</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Forced response</td>
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<tr>
<td>Impulse response</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Step response</td>
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<tr>
<td>Impulse function</td>
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<tr>
<td>Step function</td>
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<tr>
<td>Euler’s identity</td>
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</tr>
<tr>
<td>Laplace transform</td>
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<tr>
<td>Fourier series</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Fourier transform</td>
<td></td>
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</tr>
</tbody>
</table>

10. Evaluate \( \int_0^\infty e^{-\omega t} \, dt \) for \( a \) real and positive.
11. Evaluate \( \int_0^\infty e^{-st} dt \) for \( s \) complex and \( Real(s) \) positive.

12. What is \( \frac{d}{dt} e^{at} \)?

13. What are the magnitude and phase of the following complex numbers?

\[
\begin{align*}
1+j1 & \quad \text{magnitude} = \quad \text{phase} = \\
1-j1 & \quad \text{magnitude} = \quad \text{phase} = \\
-1+j1 & \quad \text{magnitude} = \quad \text{phase} = \\
1+j0 & \quad \text{magnitude} = \quad \text{phase} = \\
0+j1 & \quad \text{magnitude} = \quad \text{phase} = \\
0-j1 & \quad \text{magnitude} = \quad \text{phase} = \\
e^{j\theta} & \quad \text{magnitude} = \quad \text{phase} =
\end{align*}
\]

14. What is the complex conjugate of \( 3-j2 \)?

15. What are the Real and Imaginary parts of \( 1/(3+j4) \)?

16. What are the Real and Imaginary parts of \( e^{j\theta} \)?
17. What is \( y(t) \) given that it satisfies the following differential equation and \( y(0) = 1 \).

\[
\frac{dy(t)}{dt} + y(t) = 2
\]

18. Write the differential equation that allows one to solve for \( V_o(t) \).

\begin{equation}
V_o(t) = V_S(t) - \frac{1}{C} \int i(t) dt
\end{equation}

19. Write the differential equation that allows one to solve for \( I(t) \).

\begin{equation}
L \frac{di(t)}{dt} + R i(t) + \frac{1}{C} \int i(t) dt = V_S(t)
\end{equation}