EE 213 Quiz 1
Spring 1997

Name: ________________________________

<table>
<thead>
<tr>
<th>Problem Number</th>
<th>Maximum Points</th>
<th>Your Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>
1. (20 points) Find $f(t)$ for each of the following Laplace transforms.
   (a) $F(s) = \frac{3s+7}{s^2+4s+3}$.
   (b) $F(s) = \frac{s^2+1}{s^2+4s+5}$.

2. (20 points) There is no energy in the circuit at $t = 0^-$. Let $i_1(t)$ and $i_2(t)$ be the loop currents in the left and right loops, respectively.
   (a) Give the two simultaneous equations needed to solve for $I_1(s)$ and $I_2(s)$. Do not solve.
   (b) Express $I_0(s)$ in terms of $I_1(s)$ and $I_2(s)$.
   (c) Without explicitly finding $I_0(s)$, determine $\lim_{s \to 0} sI_0(s)$.

   Insert circuit from Fig 14.30.

3. (30 points) The switch in the circuit has been closed for a long time before opening at $t = 0$.
   (a) Construct the s-domain equivalent circuit for $t > 0$.
   (b) Find $V_0(s)$.

   Insert circuit from Fig 14.18.

4. (30 points) There is no energy stored in the capacitors in the circuit at the instant the two switches are closed at $t = 0$.
   (a) Express $v_0(t)$ in terms of $v_a(t)$, $v_b(t)$, $R$ and $C$. You should first find a differential equation with the variable $v_0(t)$.
   (b) On the basis of your result in (a), describe the operation of the circuit.
   (c) How long will it take to saturate the amplifier if $v_a(t) = 40mV$; $v_b(t) = 15mV$; $R = 50k\Omega$; $C = 10nF$; and $v_{CC} = 6V$?

   Insert circuit from Fig 7.85.