<table>
<thead>
<tr>
<th>Page</th>
<th>Points</th>
<th>Name__________</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

EE335
Final Exam
May 6, 2008

OPEN BOOK and Two page of notes

Time: 110 minutes

All work must be shown for full credit, remember units.

If excess information is given, ignore it.

If too little information is given, assume the information needed and clearly note this in your work.

Any changes to the examination will be written on the board, check the board periodically.

Stay calm and good luck.
1. Briefly describe one new thing you learned for one out of each column of these topics. Use complete sentences with proper grammar and punctuation. Don’t pick your own topic.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gyroscopes</td>
<td>Moving Coil Loudspeakers</td>
<td>Radar</td>
</tr>
<tr>
<td>Global Positioning System</td>
<td>Magnetorheological Fluids</td>
<td>Inductive Charging</td>
</tr>
<tr>
<td>Magnetic Coil Pickups</td>
<td>Satellite Radio</td>
<td>Solar Power Satellites</td>
</tr>
<tr>
<td>Metal Detectors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.

2.

3.
2. Calculate the following for a coax cable made of copper (\( \sigma = 5.8 \times 10^7 \, \text{S/m} \)) and Teflon (\( \varepsilon_r = 2.1 \) and \( \sigma = 10^{-3} \, \text{S/m} \)) at 1 Ghz if the radius of the inner conductor is 0.45mm and the radius of the outer conductor is 1.47-2.4 mm.

\[ R_s = \quad \]

\[ R' = \quad Z_0 = \quad \]

\[ L' = \quad \gamma = \quad \]

\[ G' = \quad \alpha = \quad \]

\[ C' = \quad \beta = \quad \]
3. A 0.485\(\lambda\) dipole antenna (removes the imaginary part of the impedance of a half wave dipole antenna) is driven by a 12V source with a 25 \(\Omega\) source resistance as shown. Find the power radiated, then compare the results when an impedance matching circuit is placed between the antenna and the source.

\[ P_{\text{rad}} = \text{_______________________} \]

Matched \(P_{\text{rad}} = \text{_______________________} \)
4. Use a shorted double stub to impedance match an antenna with an impedance of 40+25jΩ to an 80Ω transmission line. Place the stubs at 0.2λ and 0.45λ.

What are the normalized load impedance and admittance?

\[ z = \quad \]

\[ y = \quad \]

What is the admittance at each of these positions as you solve this problem?

1) \( y_{1in} = \quad \)

2) \( y_{2in} = \quad \)

3) \( y_{3in} = \quad \)

4) \( y_{4in} = \quad \)
5. An AM broadcast antenna array consists of two antenna separated by 751 feet 4 inches. (1 meter = 39.37") The station broadcasts at 1310 kHz. The antennas are fed with signals of the same amplitude. What phase difference between the antennas is required to produce a maximum at 15 degrees below normal to the plane of the antennas.

Phase difference = ________________
6. A 100 MHz wave polarized parallel to the plane is in air incident at 40º on a region defined by \( z > 0 \), with \( \sigma = 0 \), \( \varepsilon_r = 25 \) and \( \mu_r = 1 \), find:

a. Angle of transmission
b. The reflection and transmission coefficients
c. Time domain expression for the incident electric field
d. Time domain expression for the reflected electric field
e. Time domain expression for the transmitted electric field