PRELAB 4: TIME DOMAIN REFLECTOMETRY

<table>
<thead>
<tr>
<th>Assigned</th>
<th>September 12</th>
<th>Goal: to review main concepts related to time domain measurements.</th>
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<tbody>
<tr>
<td>Due</td>
<td>Weeks of September 19 and 26, in Lab</td>
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PRELAB 4 – ECEN 4634 (UNDERGRADUATE LAB)

1. Problem 2, page 107 in the lecture notes.
2. Problem 3, page 107 in the lecture notes.
3. Problem 5, page 107 in the lecture notes.
4. Problem 8, page 107 in the lecture notes.
5. A matched 50-Ω coaxial line is connected to a 75-Ω coaxial line of some length \( L \). Both lines are filled with a material with a relative permittivity of 2.54. The displayed delay on a TDR instrument, resulting from a unity step input at the beginning of the 75-Ω line is 2.5ns. Sketch the shape of the waveform at the input and calculate the length \( L \) of the 75-Ω coaxial line.

ADDITIONAL PRELAB 3 – ECEN 5634 (GRADUATE LAB ONLY)

6. In addition to 1-5 above, investigate the time domain response to a triangular and an impulse function for lines placed close together (coupled lines), such as in the figure below. A simple model is a capacitor between the signal line and the coupled line when end labeled A is open-circuited. When it is short circuited, the model includes inductive coupling. A voltage generator \( v_s(t) \) is connected to one of the lines. Sketch the waveform of the capacitively-coupled voltage \( v_c(t) \) along with the signal voltage if the signal voltage is a 10-V peak-to-peak, 2.5-MHz triangular wave and the coupling capacitance is 2pF. Sketch the magnetically coupled voltage \( v_m(t) \) when the end A is shorted to allow flow of current, where the mutual inductance is 50nH. The resistive loads are all 50 ohms. Next, sketch the response for the case when \( v_s(t) \) is a fast impulse function (you can make up the shape and just show the trends).