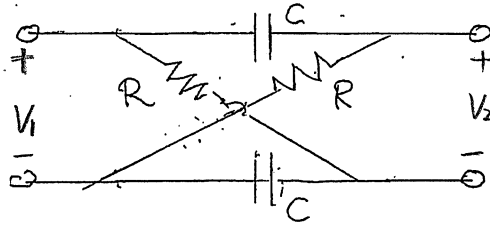


ECE 580

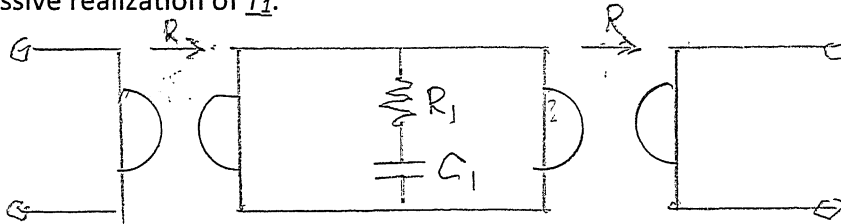
MIDTERM EXAMINATION

October 24, 2018

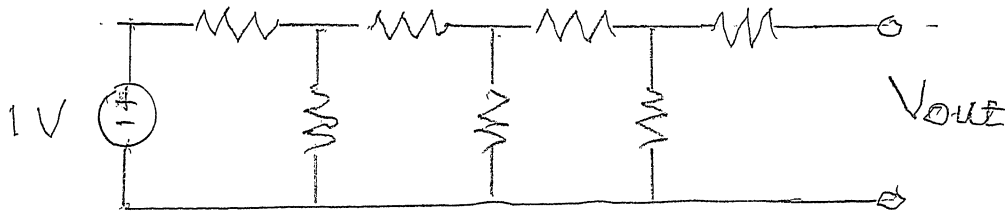
1. a. Find the voltage ratio V_2/V_1 of the lattice two-port shown.
- b. Calculate the gain $|V_2/V_1|$ and the phase shift between V_2 and V_1 as functions of ω .



2. a. Find the chain matrix \underline{T} of a gyrator with gyration resistance R .
- b. Use your result to find the chain matrix \underline{T}_1 of the two-port shown below.
- c. Find a passive realization of \underline{T}_1 .



3. Find the output voltage V_{out} of the ladder shown below. All resistors are $1\text{ k}\Omega$.



4. (Extra credit) A two-port T_a has a hybrid matrix \underline{H}_a and another one T_b has a hybrid matrix \underline{H}_b .
 - a. Show how the matrices should be interconnected so that resulting two-port has a hybrid matrix $\underline{H}_a + \underline{H}_b$.
 - b. Derive a test which indicates whether the interconnection gives the correct result.