

610 Fall 2013 – Homework 3 due Th 10/03/13

1. (50 points, reduction of Y_{def} to Y_2 -port)
For the 4×4 Y_{def} found in class of 09/24/13 find the Y_2 -port by first setting $i_4=0$, finding the resulting 3×3 admittance {this divides by $G_S + g_m + sC_g$ }, and then setting $i_3=0$ to get the 2×2 Y_2 -port. (use in both cases the partition of an admittance to get the admittance reduced by elimination of currents: $Y_{11} - Y_{12}Y_{22}^{-1}Y_{21}$ where Y_{22} in both cases will be 1×1). Discuss differences from the case where i_3 and i_4 are simultaneously set to zero..
2. (25 points, dual graph)
For the RC phase shift oscillator of the additional problem of Homework 2
 - a) Set up the graph as described there and give the cut-set and tie-set matrices.
 - b) Show that this is a planar graph
 - c) Using that graph obtain the dual graph and give its cut-set and tie-set matrices.
 - d) Show that this dual graph is planar and that its dual is the original graph.
3. (25 points, indefinite Y matrix).
For the RC phase shift oscillator of the additional problem of Homework 2 obtain the small signal indefinite admittance matrix using the node numbers given (except 0 replaced by 5). And then ground node 5 to obtain the 4×4 nodal admittance matrix. Discuss what you would do with it to get the characteristic equation (you need not actually find).