ENGR 12 Assignment 13 Optional Due: next wed

**All problems -- 2 point each to a max of 11 points  
Note: All magnitudes are RMS**

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| 1) If **V*ab*** = 400 V in a balanced Y-connected three-phase generator, find the phase voltages, assuming the   phase sequence is: *abc* | HINT: Use this phasor diagram to relate the line voltage Vab to the phase voltages Van and Vbn (or just Vab = Van – Vbn = Van+Vnb)  ale63317_12011 |
| 2) For a wye-connected load, the time-domain expressions for three line-to-neutral voltage at the terminals are:   V   V   V  Write the time-domain expressions for the line-to-line voltages vAB, vBC, and vCA. | HINT: Use the same diagram above to relate phase and line voltages. |
| 3) Obtain the line currents in the three-phase circuit below. | HINT: Draw a single phase loop of this Y-Y system starting at Van, going over line aA to the load and label the impedances of the line and the load. It will look something like this (although Zline = 0 for the problem given).    Note that even though the neutral line was removed in the figure on the left (since In = 0 for a balanced system) we can put the neutral line back when defining the line currents. Then Ia is just Van/ZY and likewise for Ib and Ic |
| 4) A 480/2400 V (rms) step-up ideal transformer delivers 50 kW to a resistive load. Calculate:  (a) the turns ratio,   (b) the primary current,  (c) the secondary current. | HINT:   1. n is the ratio of voltages,      1. Since we are given power, we can use   P1 = I1\*V1 to find the primary current, I1   1. The turns ratio can then be used to find I2 |
| 5) Determine the power absorbed by the 2 Ω resistor. Assume the 80 V is an rms value. | HINT:  Label V1 and V2 on the transformer, using the dot to locate the + sign of these voltages. Then write mesh equations for each mesh.  Since the voltages V1 and V2 and the currents I1 and I2 can be related by the turns ratio n, you can substitue values for I1 and V1 into I2 and V2 for the second mesh, yielding two equations/two unknowns. Solve those equations in MATLAB/Freemat. |
| 6) Determine the turns ratio *n* that will cause maximum average power transfer to the load. Calculate that maximum average power. | HINT: |