Homework #9, EE368, Due Monday, April 10. (version 4/5/06).
Filter Design for Ski Area of Case 4 in Chapter 8 of Dr. Grady's harmonics notes.

Step 1. Data files bdat_skia.csv and ldat_skia.csv were prepared on a 10MVA base and using the information given in Case 4 (which has been converted to metric units). Examine the .csv files and, by comparing their data to the Case 4 description, do the following:

- Verify that the R, X, and line charging VAr information in ldat_skia.csv for the segment between Bus 6 (Base) and Bus 7 (Star) is correct.
- Verify that the nonlinear load information in bdat_skia.csv for Bus 14 (WipeOut) is correct.
- Verify that the 138kV transmission system equivalent information given in bdat_skia.csv agrees with the information given in the Case 4 description (i.e., the subtransient values in the file are derived from the Isc = 34.4pu, 10MVA base, X/R = 5.0 values shown in the box).

Step 2. Run PCFLOH using the given bdat_skia.csv and ldat_skia.csv files and confirm that you obtain the same results given in revised Figure 8.6 and in the spectral contents given in revised Figures 8.7-8.11. To run PCFLOH.exe, bdat_skia.csv, and ldat_skia.csv in a directory, click on PCFLOH.exe, and enter _skia.csv in the input field. Follow the instructions by clicking the buttons. View waveforms by clicking on bus numbers or branches.

Step 3. Without using phase shifting transformers, design and test a filter strategy that meets the following criteria:

- Displacement power factor at the substation transformer 138kV bus is corrected so that it falls between 0.95 (lagging) and 1.0.
- Filters are either 300kVAr or 600kVAr each.
- Tune 0.3pu Hz (i.e., 0.3 ● 60 = 18Hz) below the harmonic target.
- Assume X(at 60Hz)/R ratio of filter inductors = 50.
- No more than 600kVAr of filters are added at any single bus.
- Max THDv in the 12.5kV system < 4.5% (ignore the contributions of harmonics above the 13^{th})
- Max fundamental V1 in the 12.5kV system, excluding filter capacitors, is less than 105% (note – see Step 4 if you cannot achieve this)

Use impedance scans to confirm that the filters produce impedance dips at the desired frequencies. Note – a filter example is given in Chapter 6 of the harmonics notes.

Step 4. If you are unable to satisfy the V1 limit, then consider adding a phase shifting transformer to a large drive. This can be done by specifying a "nonlinear device phase shift" of 30 degrees in the corresponding row of the BDAT file. It may be necessary to remove some of the filters.

Step 5. Your final BDAT and LDAT files, containing your solution, should be named bdat_yourname.csv, ldat_yourname.csv, and emailed to Dr. Grady for checking.
Step 6. Prepare a hardcopy final report (no more than 3 pages). The preferred format is as a Word.doc