ECE 588 Fall 2018

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Homework 3

due: Thursday, October 18, 2018

1. Consider the three-machine system in Problem 2 of **Homework 1**.
   (*a*) Prepare a plot of *LOLP* vs. load by computing the *LOLP* at a sufficient number of points for each daily load value using the load data in Problem 3 in **Homework 1**.
   (*b*) Making use explicitly of the *LOLP* curve at the weekly peak load of 1,200 *MW*, determine the value of α in the approximation of *G(x)* by $K e^{-\alpha x}$.
   (*c*) Suppose that a fourth unit with 300 *MW* capacity with 0.05 *F.O.R.* is added. Evaluate its *effective load carrying capability* c_{eff} at the value of *LOLP* corresponding to the weekly peak load.
   (*d*) Consider again the three-machine system. Suppose that a *DSM* (demand-side management) program is implemented and used whenever the load is strictly greater than 1100 *MW* with the effect of attaining a 50-*MW* load reduction. Compute the *effective load carrying capability* c_{eff} of this *DSM* program (Note: in this case, c_{eff} is the amount of additional load that the system can supply at the same reliability with the implemented *DSM* program).

   Provide plots of the modified *LOLP* curves whenever appropriate in parts (*c*) and (*d*).

2. Verify the computations for the two-area interconnected system discussed in class. (It suffices to show how an entry of each table is evaluated.)

3. Compute the quantities $P\left\{\underset{\sim}{R}^A < 0\right\}$ and $\mathcal{F}\left\{\underset{\sim}{R}^A < 0\right\}$ for values of c_t:
   (*i*) 50 *MW*
   (*ii*) 100 *MW*

4. Derive the expressions for $P\left\{\underset{\sim}{R}^B < 0\right\}$ and $\mathcal{F}\left\{\underset{\sim}{R}^B < 0\right\}$ for the case that the tie is deployed to provide assistance to area *B* from area *A*.

Note: Minimize the amount of tedium in doing these problems; my aim is to see that you understand the concepts and not that you can do the arithmetic. Feel free to make any shortcuts that you can justify.