EE 5885: Reliability of Engineering Systems

Homework Assignment 4

Due April 11, 2022

Manually perform the following simple exercise in generation adequacy evaluation using discrete convolution.

(a) Build a capacity outage table with probability and frequency distributions for a system consisting of the following three generators:

capacity (MW)	λ (/y)	μ (/y)
30	5	20
20	15	35
50	3	27

(b) Build a load model for the first 24 h in the IEEE-RTS (refer to [1]) load curve, but use 85 MW for the annual peak load, and 10 MW intervals. You may get the load for the first 24 h by calculating them from the data provided in the IEEE paper, or you may use the data file LDAT.RTS (also available on Wyocourse). If you use the latter, note that the data in the file LDAT.RTS consists of 1092 rows, where each row provides the loads for eight consecutive hours, as a fraction of the annual peak load, and each hourly load value is 10 characters long; there are no delimiters separating the values. You would simply read off the first 24 values (from the first three rows), and multiply them by 85 MW.

(c) Build the generation reserve model for this system, using 10 MW intervals.

(d) Calculate the LOLP, LOLF (in failures/d) and EUE (in MWh/d) for this case.

[1] "IEEE reliability test system," IEEE Transactions on Power Apparatus & Systems, vol. 98, no. 6, pp. 2047-2054, November/December 1979. (Available on Wyocourse).