EEE6008 Problem Question – Reliability Mathematics

20 electronic components were life-tested for a fixed duration at 60, 70 and 85^{o}C under otherwise identical operating conditions. The output from the 20 devices under test at 85^{o}C was investigated and the following failure times determined from extrapolation of their degradation over the allocated testing duration. Out of the initial 20 devices, 10 devices were found to have reached the criteria for failure after 9300, 16100, 5500, 700, 1900, 25200, 3000, 11900, 4400, and 11500 hours. The remaining 10 devices exhibited slower degradation.

1) Rank the 85^{o}C data using Bernard's approximation and plot on lognormal or Weibull reliability plotting paper (for practice why not try both).

2) Suggest the main cause of failure in these devices (according to region of the bathtub curve)

3) Extract the MTTF (50% cumulative failures)

Similar analysis performed at 60^{o}C and 70^{o}C yield MTTF of 59900 hours and 41000 hours respectively.

4) Using an Arrhenius plot, determine the activation energy and use to calculate the MTTF at 20^{o}C. (Use k = 8.617343×10^{-5} eV/K)