TMA 4275 Lifetime Analysis 2014
Homework 4

Problem 1

Consider the data (stars denote censored observations)

31.7, 39.2*, 57.5, 65.5, 65.8*, 70.0, 75.0*, 75.2*, 87.5*, 88.3*, 94.2, 101.7*, 105.8*, 109.2, 110.0, 130.0*

a) Calculate "manually" the Kaplan-Meier estimator $\hat{R}(t)$. Graph it both on paper and using MINITAB.

b) Calculate the estimate for MTTF based on the plot. (Check that you get the same result as MINITAB).

c) Estimate (if possible) the quartiles, $t_{0.25}, t_{0.50}, t_{0.75}$. Check with MINITABs results for median and IQR.

d) Calculate the estimate for $\widehat{SD(\hat{R}(t))}$ and check with MINITABs result.

Problem 2

Let the data be the same as in Problem 1.

a) Calculate "manually" the Nelson-Aalen estimator $\hat{Z}(t)$ and draw the plot on paper. What can you conclude about the hazard rate of the underlying distribution?

b) Use the MINITAB macro for Nelson-plot (found under the heading "MINITAB Macros for TMA4275" under Statistical Software on the course web page) to check your computation and drawing.

c) Use also the Kaplan-Meier estimate in Problem 2 to estimate $Z(t)$ and compare with the result obtained in (a) of this problem.

Problem 3

An experiment has been carried out to gain information on the strength of a certain type of braided cord: 48 pieces of cord were investigated, 7 cords were damaged during the experiment, implying right-censored values (starred observations)

26.8*, 29.6*, 33.4*, 35.0*, 36.3, 40.0*, 41.7, 41.9*, 42.5*, 43.9, 49.9, 50.1, 50.8, 51.9, 52.1, 52.3, 52.3, 52.4, 52.6, 52.7, 53.1, 53.6, 53.6, 53.9, 53.9, 54.1, 54.6, 54.8, 54.8, 55.1, 55.4, 55.9, 56.0, 56.1, 56.5, 56.9, 57.1, 57.1, 57.3, 57.7, 57.8, 58.1, 58.9, 59.0, 59.1, 59.6, 60.4, 60.7

a) Calculate "manually" the Kaplan-Meier estimator $\hat{R}(t)$. Graph it both on paper and using MINITAB.

b) Calculate "manually" the Nelson-Aalen estimator $\hat{Z}(t)$ and draw the plot on paper.

c) Discuss the effect of this type of censoring.

d) Describe the form of the failure rate function.