

CHUKA**UNIVERSITY****UNIVERSITY EXAMINATIONS****EXAMINATION FOR THE AWARD OF DEGREE OF MASTER OF SCIENCE
IN APPLIED STATISTICS****MATH 856: SURVIVAL DATA ANALYSIS AND CLINICAL TRIALS****STREAMS: MSc. Applied Statistics****TIME: 3 HOURS****DAY/DATE: THURSDAY 20/4/2023****2.30 P.M. – 5.30 P.M.****INSTRUCTION: Answer ANY Four Questions****QUESTION ONE (15MARKS)**

- (a) The following are times (in years) taken by 10 Actuarial students to qualify as Actuaries after the start of the professional papers. 9, 13, 13*, 18, 23, 28, 31, 34, 45*, 48. Calculate the Kaplan-Meier estimator and comment on it with regard to this performance.

[10marks]

- (b) Write an R-program code that fits a Kaplan Meier estimator of the survival function $S(t)$ and its plot

[5marks]

QUESTION TWO (15MARKS)

- (a) Define the following terms as used in Survival Analysis by Actuaries:

- (i) Survivorship function
- (ii) Hazard function
- (iii) Right censoring
- (iv) Left Censoring
- (v) Censored Data

[5marks]

- (a) The following are failure times of two groups of Asthma patients. Group 1 consists of patients who received the drug coded 10-mp while group 0 is the control group (did not

receive the treatment). Assuming the exponential distribution for failure time, test the hypothesis that 10-mp treatment is not effective for Asthma at 95% level of significance.

[10marks]

Group 0	1	3	5	6*	12
Group 1	9	14	15	15*	30*

QUESTION THREE (15MARKS)

- (a) After the collapse of prices in the stock exchange in August 2008 Mr U.P.Winder noted the number of months taken before some branches at Richquick and Steady Save banks went into liquidation. The observed numbers of months, for two samples, each of size 6, were as follows (censored times shown with +):

Richquick: 13, 8, 45, 43+, 5, 1

Steady Save: 40, 86+, 91+, 47, 1, 33.

Use the log-rank test at the 5% level to determine whether there is a significant difference in the times to liquidation of the branches.

[12marks]

- (b) Write an R-program code that fits a log-rank test problem in **QUESTION THREE** (a)

[3marks]

QUESTION FOUR (15MARKS)

- (a) The following is a report of a chemical trial to evaluate the efficiency of maintenance chemotherapy for acute leukemia. Patients are randomly allocated to group A and B. Group A received maintenance chemotherapy and group B did not. The following data on time to relapse (weeks) time to remission, were observed.

Group A	9	13	13+	18	23	28+	34	34	45+	48	116+
Group B	5	5	8	8	12	23	23	30	33	43	45

For the 95% confidence interval for group A and B. Assuming an exponential distribution

[9marks]

- (b) The consideration for selection of study site is probably their ability to enroll patients and to complete the study within the planned time frame for a selected study Centre. Outline selection process for patients in such a study [6Marks]

QUESTION FIVE (15MARKS)

- (a) Differentiate between inclusion criteria and exclusion criteria as used in clinical trials and give an example for each. [6marks]

- (b) Show that if the Hazard function has the form $\alpha\beta(\alpha t)^{\beta-1} \exp[(\alpha t)^\beta]$, then the

Survivorship function is $\exp\left\{-\left[\exp(\alpha t)^\beta - 1\right]\right\}$.

[9marks]

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