MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2019/2020 ACADEMIC YEAR
FOURTH YEAR SECOND SEMESTER

SCHOOL OF SCIENCE AND INFORMATION SCIENCES
BACHELOR OF SCIENCE & EDUCATION

COURSE CODE: STA 427
COURSE TITLE: SURVIVAL MODELS AND ANALYSIS

DATE: 17/04/2019 **TIME: 8:30AM – 10:30 AM**

INSTRUCTIONS TO CANDIDATES

1. Answer **Question ONE** and any other **Two** questions.

2. Show all the workings clearly
3. Do not write on the question paper

4. All Examination Rules Apply.

Question One (30 Marks)

a) Define the following terms as used in Survival Models and Analysis

i) Survival Analysis **(2 Marks)**

ii) Censoring **(2 Marks)**

iii) Truncation **(2 Marks)**

b) Given the hazard function $h(t) = e^{t},\ t \geq 0,$ derive $s(t)\ and\ f(t)$ **(5 Marks)**

c) Suppose that the survival distribution of a group of patients follows exponential distribution with $\lambda = 0.25$

i) Calculate the (a) Mean survival time **(2 Marks)**

(b) Median survival time **(2 Marks)**

(c) probability of surviving 6 years or more **(3 Marks)**

ii) Plot the hazard function. **(2 Marks)**

d) The following show the lifetime of patients enrolled in a clinical trial, with (+) indicating censored observations. : 4.0, 5.0^{+}, 6.7^{+}, 7.5, 7.5, 9.4^{+},11.0, 11.0^{+}, 13.0, 16.0

i) Calculate the PL estimate of the survivorship function **(5 Marks)**

ii) Determine the variance of S(t) for each failure time. **(5 Marks)**

Question Two (20 Marks)

a) Define the following terms as used in Survival analysis

i) Survivorship function **(2 Marks)**

ii) The probability function of the survival time **(2 Marks)**

iii) Hazard function **(2 Marks)**

b) Consider the survival data given below

Year of follow up	Number alive at the beginning of interval	Number of dying on interval
0-3	1100	240
3-6	860	180
6-9	680	184
9-12	496	138
12-15	358	118
15-18	240	60
18-21	180	52
21-24	128	44
24-27	84	32
≥27	52	28

Compute and plot the estimated $s(t), f(t)$ and $h(t)$ **(14 Marks)**

Question Three (20 Marks)

The data below are remission times in weeks for a group of 30 patients with a disease who received a similar treatment: 1, 1, 2, 4, 4, 6, 6, 6, 7, 8, 9, 9, 10, 12, 13, 14, 18, 19, 24, 26, 29, 31^+, 42, 45^+, 50^+, 57, 60, 71^+, 85^+, 91

i) Obtain and plot the K-M estimate of the survivor function for the remission time.

(10 Marks)

ii) Obtain the 95% confidence Interval for the median remission time

(5 Marks)

iii) Determine the 95% confidence interval for the probability that remission lasts over 26 weeks

(5 Marks)

Question Four (20 Marks)

a) In a clinical trial the following results were obtained for a group of 146 patients.

I_j	D_j	W_j	N_j
[0, 1]	27	3	146
[1, 2]	18	10	116
[2, 3]	21	10	88
[3, 4]	9	3	57
[4, 5]	1	3	45
[5, 6]	2	11	41
[6, 7]	3	5	28
[7, 8]	1	8	20
[8, 9]	2	1	11
[9, 10]	2	6	8

i) Carry out a full life table analysis **(14 Marks)**

ii) Find the life-table estimate of S(4), S(7), and S(10) and their estimated variance **(6 Marks)**

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