LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **STATISTICS**

FOURTH SEMESTER – **APRIL 2022**

PST 4503 – BIOSTATISTICS AND SURVIVAL ANALYSIS

Date: 20-06-2022 Dept. No. Max. :100 Marks

Time: 01:00-04:00

SECTION – A : ANSWER ALL THE QUESTIONS (10 X 2 = 20)

1 Define Biostatistics and state any two uses of Biostatistics

2 Write any two advantages of cross sectional studies

3 Explain sensitivity and specificity of a diagnostic test procedure with an example

4 Provide the McNemar test statistic for comparing paired proportions.

5 Define survival time and give an example.

6 How do you find whether a given Survival time data follows a Weibull distribution?

7 Explain Life Table Analysis

8 Define Log-rank statistic and state its uses.

9 Explain the proportional hazard assumption

10 What is the use of extended Cox model?

SECTION – B: ANSWER ANY FIVE THE QUESTIONS (5X 8 = 40)

11 a) Discuss Patient selection in a Clinical trial. (4)

b) What are the questions answered by a Clinical trial protocol? (4)

12 Explain Receiver Operating Characteristic Curve.

13 Explain Type II and progressively censoring of data with an example each.

14 If the survival time follow the Weibull distribution. Find the survival function and draw the curve for $\lambda = 1$ and $r = 0.5$ and 2

15 a) Dierive f(t), S(t) and h(t) for Exponential Distribution. (4)

b) Consider the following remission times in weeks for 21 patients with acute leukemia: 1, 1, 2, 2, 3, 4, 4, 5, 5, 6, 8, 8, 9, 10, 10, 12, 14, 16, 20, 24, and 34. Assume that remission duration follows the Exponential distribution. Obtain 95% confidence interval for λ. (4)

16 Obtain the accelerated failure model for lognormal distribution and the corresponding hazard function

17 Explain the maximum likelihood estimation of parameters of a Cox PH model.

18 Explain Stratified Cox model in detail

SECTION – C: ANSWER ANY TWO QUESTIONS **(2X 20= 40)**

19 Obtain Kaplan-Meier Survival curves based on the data given below and provide your conclusion: (20)

Treatment A: 6, 6, 6, 7, 10, 13, 16, 22, 23, 6+ , 9+, 10+, 11+, 17+, 19+, 20+, 25+, 32+, 32+, 34+, 35+

Treatment B: 1, 1, 2, 2, 3, 4, 4, 5, 5, 8, 8, 8, 8, 11, 11, 12, 12, 15, 17, 22, 23

20 Determine (i) Sensitivity (ii) specificity (iii) False positive rate (iv) False Negative rate (v) PV+ (vi) PV- (vii) LR+ (viii) LR- (ix) Odds Ratio and (x) Accuracy, based on the test results shown below: (Each carries 2 marks) (20)

	+ve test result	-ve test result
Disease Present	75	18
Disease Absent	2	5

21 a) Discuss any two graphical approaches for assessing proportional hazard assumption. (10)

21 b) Derive the likelihood equations for a Weibull model with censoring. (10)

22 a) In order to computerize patients' record, a data clerk is hired to transcribe medical data from the patients' chart to computer coding forms, the number of correct entries between errors is listed in chronological order of occurrence over a period of five days as follows: 73, 12, 40, 65, 100, 15, 70, 40, 110, 64, 200, 6, 90, 102, 20, 102, 90 and 34. Assuming that the correct entries between errors follow the two-parameter exponential distribution, obtain: (10)

(10) An estimate of G

(ii) The MLE of λ

(iii) The MLE of μ

(iv) The probability of 100 correct entries between two errors

22 b) Explain the following:

(10) Trials with independent concurrent control.

(10)

(ii) Randomized and Non-randomized trials

(iii) Trials with self control

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