LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FOURTHSEMESTER – APRIL 2018

ST 4815- BIO-STATISTICS

Date: 08-05-2018   Dept. No.   Max. : 100 Marks
Time: 09:00-12:00

Section – A

Answer all the questions   **10 X 2 = 20 marks**

1. Define the two broad categories of study designs in medical field.

2. Define morbidity rate used in epidemiology.

3. Write any two merits of case control studies.

4. Compare between experimental and control event rate.

5. Define Kappa Statistic.

6. Define Sensitivity and Specificity.

7. What is remission and relapse time?

8. Write a note on survival distributions.

9. Why a Cox model is preferred to logistic model?

10 Write in short about adjusted survival curves using the Cox PH model.

Section – B

Answer any five questions   **5 X 8 = 40 marks**

11. From the following data find (a) Experimental event rate (b) Control event rate (c) Relative risk (d) Absolute risk reduction . Also interpret the results.

	Aspirin	Placebo
Microcardial Infarction fatal	12	28
Microcardial Infarction Non-fatal	131	215

12. The test performance for identifying certain health conditions based on MRI and Histology is given below:

		Histology	
		Positive	Negative
MRI	Positive	58	4
	Negative	12	24

Find the strength of agreement between MRI and Histology.

13. Explain Levene's test used for testing the equality of variances.

14. Explain Type I and Type II censoring of data with an example each.

15. Consider a clinical trial in which 10 lung cancer patients are followed to death. If the survival times in months are given as

         4   5   6   8   8   8   10   10   11   12.

   Find the estimated median survival time with the help of survival curve. Compare the answer with that of interpolation.

16. In an experiment comparing two types of tumor 6 patients are assigned to treatment A and 6 patients are assigned to treatment B. The experiment is terminated after 30 days. The following survival times are recorded in days. Obtain the survival function using Kaplan-Meier.

       Treatment A : 8   8   10   12   12   13

       Treatment B : 9   12   15   20   30+   30+

17. If the survival time follows the gamma distribution find the hazard function and draw the curves for $\lambda = 1$ and $r = 1$, $r < 1$, $r = 2$ and $r = 4$.

18. Explain log-log survival curves of a Cox PH model.

Section C

Answer any two questions   **2 X 20 = 40 marks**

19. Explain in detail the four the four types of observational study designs in medical studies with the necessary diagrams.

20. The remission time (in weeks) for two groups of leukemia patients are given below:

   Group 1 : 6 6 6 7 10 13 16 22 23 6+ 9+ 10+ 11+ 17+ 19+ 20+ 25+ 32+
                  32+ 34+ 35+

   Group 2 : 1 1 2 2 3 4 4 5 5 8 8 8 8 11 11 12 12 15 17 22 23

   Test the significant difference between the two treatments using logrank test chi-square test.

21. Fasting blood glucose (mg/100ml) determinations made on 36 non obese, apparently healthy adult males are shown below. Using the Kolmogorov-Smirnov goodness of fit test can it be concluded that these data are not from a normally distributed population with a mean of 80 and a standard deviation of 6.The values are

75	92	80	80	84	72
84	77	81	77	75	81
80	92	72	77	78	76
77	86	77	92	80	78
68	78	92	68	80	81
87	76	80	87	77	86

22. (a) Explain the time dependent covariates method for assessing the Cox PH assumption..

   (b) In a 10-year follow-up study conducted in Evans County, Georgia, involving persons 60

years or older ,one research question concerned evaluating the relationship of social support to mortality status. A Cox proportional hazards model was fit to describe the relationship of a measure of social network to time until death. The social network index was denoted as SNI ,and took on integer values from 0 (poor network) to 5 (excellent) social network. Variables to be considered for control in the analysis as either potential confounders or potential effect modifiers were AGE (treated continuously), RACE(0,1) and SEX(0,1).

(i)   State an initial PH model that can be used to assess the relationship of interest,which considers the potential confounding and interaction effects of the AGE,RACE , and SEX (assume no higher than two –factor products involving SNI with AGE , RACE and SEX).

(ii)   For our model in part1a, give an expression for the hazard ratio that compares a person with SNI =4 to a person with SNI=2 and the same values of the covariates being controlled.

(iii)   Describe how you would test for interaction using your model in part 1a.In particular state the null hypothesis, the general form of your test statistic ,with its distribution and degrees of freedom under the null hypothesis.

(iv)   Assuming a revised model containing no interaction terms ,give an expression for a 95% interval estimate for the adjusted hazard ratio comparing a person with SNI =4 to a person with SNI =2 and same values of the covariates in your model.

(10 + 10) marks.