



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – STATISTICS

FOURTH SEMESTER – APRIL 2015

ST 4815 - BIO-STATISTICS

Date : 20/04/2015

Dept. No.

Max. : 100 Marks

Time : 09:00-12:00

SECTION A

Answer **ALL** the following:

(10 X 2 =20)

- 1) Define experimental event rate.
- 2) Define sensitivity of a diagnostic test.
- 3) Explain the use of Kappa Statistic.
- 4) Define survival time.
- 5) Write the hazard function for a Weibull distribution.
- 6) Write the MLE of μ for lognormal distribution without censoring.
- 7) Define mortality rate.
- 8) Write the Cox PH model explaining the terms involved.
- 9) In the AFT model for exponential, what is the distribution of ϵ ?
- 10) Define incidence and prevalence.

SECTION B

Answer any **FIVE** the following:

(5 X 8 =40)

- 11) Explain the different types of observational studies.
- 12) A new laboratory test produced positive results in 138 of the patients who actually have the disease and positive results in 24 of the patients who actually do not have the disease
(i) Sensitivity (ii) specificity (iii) PV+ and (iv) LR+
- 13) Consider the following data on survival times (in weeks) of 12 patients who were treated with treatment A and another group of 12 patients with treatment B.

| | | | | | | | | | | | | |
|-------------|----|----|----|-----|-----|----|-----|-----|----|-----|----|-----|
| Treatment A | 13 | 14 | 16 | 18+ | 23+ | 10 | 8 | 21+ | 26 | 24+ | 18 | 17 |
| Treatment B | 10 | 8 | 12 | 13 | 24+ | 17 | 18+ | 19+ | 21 | 24 | 12 | 16+ |

Construct Kaplan-Meier curves and find out which treatment is better?

- 14) Explain type-I, type-II, type-III censoring in detail.
- 15) Explain Levene's test.
- 16) Explain the stratified cox model with an example.
- 17) Obtain the accelerated failure model for lognormal distribution and the corresponding hazard function.
- 18) Explain hazard ratio. Give an example for non constant hazard ratio.

SECTION C

Answer any **TWO** the following:

(2 X 20 =40)

- 19) Explain the different techniques used to find whether the given survival data satisfies PH assumption for a cox model.
- 20) (i) Derive the likelihood equations for a Weibull model with censoring.
(ii) Obtain the AFT model and the corresponding hazard function for the Weibull model.
- 21) Explain the three phases of the clinical trials in detail and the issues related to clinical trials.
- 22) (a) A group of young people using a specified drug and who had a stroke and also the people who are not affected is given below.

| | Stroke | Control |
|---------------|--------|---------|
| Drug abuse | 73 | 18 |
| No drug abuse | 141 | 196 |

- (i) Obtain the odds ratio
(ii) Calculate the experimental event rate
(iii) Obtain control event rate
(iv) Relative risk reduction
(v) Relative risk and interpret the measures. **(10)**

- (b) Two physicians classified the mammograms of 50 persons as follows.

| | Physician 2 | |
|-------------|-------------|----------|
| Physician 1 | Negative | Positive |
| Negative | 25 | 5 |
| Positive | 10 | 10 |

Use Kappa statistic and Mcnemar test to find the agreement. **(6)**

- (c) Use the exact sign test for the previous problem. **(4)**
