

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2024
(Regular/Improvement/Supplementary)

STATISTICS
FMST3E15 - LIFE TIME DATA ANALYSIS

Time: Three Hours

Maximum Weightage: 30

Part A: Answer any *four* questions. Each carries *two* weightage.

1. Discuss the Log-normal distribution and how it differs from other lifetime distributions.
2. Describe the Nelson-Aalen estimator. How is it used in the estimation of cumulative hazard functions?
3. What is the role of interval censoring in survival analysis? How is it different from right censoring?
4. What are threshold parameters?
5. Explain the monotonicity of the hazard function. Show that for Weibull distribution, the hazard function is monotonic for specific values of the shape parameter.
6. Describe Log location-scale models and their importance in lifetime data analysis.
7. Define accelerated time regression models and describe their inference procedures.

(4 × 2 = 8 weightage)

Part B: Answer any *four* questions. Each carries *three* weightage.

8. Distinguish between type II and progressive type II censoring. Obtain the likelihood function in each case, based on a random sample of size n .
9. Describe the construction and use of life tables in survival analysis.
10. What is the mean residual life function? Obtain its relationship with hazard function.
11. Explain the role of probability plots and hazard plots in diagnostic checking. Illustrate its utility with the help of a distribution.
12. Discuss the impact of truncation in survival analysis. How does it differ from censoring, and how is it addressed?
13. Explain the concept of mixture models and provide examples of their use in survival analysis.
14. Explain the assumptions behind the Cox proportional hazards model. How do you test for the proportional hazards assumption?

(4 × 3 = 12 weightage)

(P.T.O.)

Part C: Answer any two questions. Each carries *five* weightage.

15. Explain the concept of censoring in survival analysis. What are the different types of censoring, and how do they impact the analysis?
16. Describe the estimation of survival function for Left -Truncated and Right-Censored data.
17. Describe the parameter analysis when the lifetimes follow exponential distribution for:
i) complete data; ii) type I censored data; iii) type II censored data.
18. Describe the log-rank test. How is it used to compare survival curves between different groups?

(2 × 5 = 10 weightage)