D3AST2404 **(2 Pages)** **Name.....**
Reg.No.....

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2025
(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. Write a short note on Inverse Gaussian Distribution.
2. Contrast the failure rate behaviour of the Weibull distribution for different values of its shape parameter. What does each case signify about the ageing process?
3. Define the cumulative hazard function, H(t). Explain its interpretation and its mathematical relationship with the survival function, S(t).
4. Explain log location scale family. Show that log normal distribution belongs to this family.
5. Define accelerated time regression models. What are the graphical methods to identify accelerated failure time regression model?
6. Describe Generalised Wilcoxon test procedure.
7. Describe Nelson-Aalen estimator and give an estimate of its asymptotic variance.

(4 × 2 = 8 weightage)

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

8. Compare and contrast Type I and Type II censoring schemes. For a clinical trial, which scheme is being used if the study ends after 3 years, and which is being used if it ends after 100 patients experience the event of interest?
9. Explain the process of constructing a 95% confidence interval for the survival probability at a specific time point. What role does Greenwood's formula play in this calculation?
10. What is the significance of p-p plots in Survival Analysis?
11. What is mean residual life function? Obtain its relationship with hazard rate. Also show that the mean residual life function uniquely determines the distribution.
12. Justify Cox Likelihood as a profile likelihood.
13. Define proportional hazards model. Explain the method for estimating the parameter vector and the cumulative baseline hazard function.
14. Explain the linear rank test for comparing log-location scale distributions under uncensored data.

(4 × 3 = 12 weightage)

(P.T.O.)

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

15. Explain the general formulation of right censoring and also derive the likelihood function.

16. Define Kaplan Meier Estimator and Nelson Aalen Estimator. Show that KM estimator can be derived as a non-parametric MLE.

17. What is Life Table? Explain.

18. Discuss the parameter analysis when the lifetimes follow exponential distribution for: i) complete data ii) type I censored data iii) type II censored data.

(2 × 5 = 10 weightage)