

**THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2020**  
**STATISTICS**  
**FMST3E15 - LIFE TIME DATA ANALYSIS**

**Time: Three Hours**

**Maximum Weightage: 30**

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

1. Define hazard rate. Show that hazard rate uniquely determines the lifetime distributions.
2. Present Weibull distribution as a lifetime model and mention its importance.
3. Describe Nelson-Aalen estimate and give an estimate of its asymptotic variance.
4. What is the significance of p-p plots in Survival Analysis?
5. What are threshold parameters? Explain.
6. Describe the relevance of multivariate lifetime models with an example.
7. What is a proportional hazards model. Why is it called so?

**(4 × 2 = 8 weightage)**

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

8. What is mean residual life function? Obtain its relationship with hazard rate. Also show that the mean residual life function uniquely determines the distribution.
9. Derive the expression for likelihood function in the case of type II censoring based on a random sample of size n.
10. Explain the standard life table methods.
11. What are the likelihood based methods for location scale distributions? Explain
12. Discuss the procedure for comparing two exponential distributions.
13. Derive the Cox likelihood as a marginal likelihood.
14. Discuss briefly the log rank test with censored data.

**(4 × 3 = 12 weightage)**

**(P.T.O.)**

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

15. Describe the general formulation of right censoring and also derive the likelihood function.
16. For the data on remission times (in days) of Leukaemia patients is given below. Obtain Kaplan-Meier estimator of survival function  $S(t)$  at  $t= 6, 10, 22$  and  $35$ .  
6, 6, 6, 6\*, 7, 9\*, 10, 10\*, 11\*, 13, 16, 17\*, 19\*, 20\*, 22, 23, 25\*, 32\*, 32\*, 34\*, 35.  
(Here \* denote the censored observations).
17. Explain the likelihood based inference procedures for Weibull distribution. Also find the exact confidence interval in Type II censoring scheme.
18. Explain the procedures to estimate the parameters in a proportional hazard model from incomplete data.

**(2 × 5 = 10 weightage)**