

M.Sc. Examination, 2018
Semester-IV
Statistics
Course : MSC-42
(Survival Analysis)

Time : 3 Hours

Full Marks : 40

Questions are of value as indicated in the margin

Answer **any four** questions

1. (a) What do you mean by censoring? What are the different types of censoring? How will you construct the likelihood if the data is right censored? Give an example.
(b) For an exponential distribution with mean λ , find expressions for median survival time and mean residual survival time. (1+2+4)+3=10
2. Define survival function, hazard function and establish their interrelationship with distribution function? Why is it important to have separate expression for hazard function? For Weibull and log-normal distributions, find expressions for all of these three functions and comment. 3+2+5=10
3. Describe a nonparametric method to estimate a survival function for censored data. Find the expression of the variance of the estimator. 4+6=10
4. What is a Cox-proportional hazard model? Why is it called proportional? Describe, in details, the estimation procedure for the parameters involved in the model. 2+1+7=10
5. How will you compare two survival functions? Describe the weighted log-rank test in this regard. Also find the asymptotic distribution of the test statistic. 2+4+4=10
6. Define cause specific hazard function and cumulative incidence function. Clearly stating all assumptions, derive the likelihood function for competing risk. Show that the overall survival function $S(t)$ can be expressed as

$$S(t) = \sum_j P(T > t, C = j)$$

(symbols having usual meaning)

3+3+4=10
