

Total No. of Printed Pages—4

6 SEM TDC DSE STS (CBCS) 3 (H)

2022

(June/July)

STATISTICS

(Discipline Specific Elective)

(For Honours)

Paper : DSE-3

(**Survival Analysis and Biostatistics**)

Full Marks : 50

Pass Marks : 20

Time : 2 hours

*The figures in the margin indicate full marks
for the questions*

1. Choose the correct answer from the following : 1×5=5

(a) Given the hazard function

$$h(t) = \alpha\lambda(\lambda t)^{\alpha-1}; \lambda > 0$$

If $\alpha > 1$, then we have

- (i) increasing failure rate (IFR)
- (ii) constant failure rate (CFR)
- (iii) decreasing failure rate (DFR)
- (iv) None of the above

- (b) Given the death density function

$$f(t) = (\lambda_0 + \lambda_1 t) \exp \left[- \left(\lambda_0 t + \frac{\lambda_1}{2} t^2 \right) \right]$$

Then its survival function $s(t)$ is

- (i) $(\lambda_0 + \lambda_1 t)$
 - (ii) $\exp \left[- \left(\lambda_0 t + \frac{\lambda_1}{2} t^2 \right) \right]$
 - (iii) $(\lambda_0 + \lambda_1 t^2)$
 - (iv) $\exp \left[- \left(\lambda_0 + \frac{\lambda_1}{2} t^2 \right) \right]$
- (c) Which of the following is not a **measure** of competing risk theory?
- (i) Crude probability
 - (ii) Net probability
 - (iii) Partially net probability
 - (iv) Partially crude probability
- (d) The coefficient of skewness for the distribution of the duration of time T of the epidemic when $n \rightarrow \infty$ is
- (i) 0.6
 - (ii) 0.7
 - (iii) 0.8
 - (iv) 0.9

(e) Mating is said to be random, if

(i) $P(A_i A_j) = g_{ij} = g_i g_j$

(ii) $P(A_i A_j) = g_{ij} \neq g_i g_j$

(iii) $P(A_i A_j) = g_i$

(iv) $P(A_i A_j) = g_j$

2. Answer the following in brief of the following : 2×5=10

(a) Define survival function and hazard function.

(b) Explain with example how censoring occurs in medical experiment.

(c) State general epidemic model.

(d) Define clinical trial.

(e) Define genotype and phenotype.

3. (a) Show that

$$s(t) = \exp \left[- \int_0^t h(x) dx \right]$$

3

(b) (i) Find the survival function $s(t)$ and probability density function $f(t)$ when hazard function is $h(t) = \lambda$.

2+2=4

Or

(ii) Find the survival function $s(t)$ and probability density function $f(t)$ for a distribution having bath-tub shaped hazard function.

4

(c) Discuss about different types of censoring schemes with examples. 4

(d) (i) Estimate the mean survival time for type-I censored data. 5

Or

(ii) Estimate the survival function by Kaplan-Meier method.

4. (a) Stating the assumptions explicitly, obtain the expression of crude probability due to risk $R_{\delta}(Q_{\delta})$. 7

Or

(b) Derive the relationship between crude probability and net probability (Type A).

5. (a) Define epidemiology and write about its objectives. 5

Or

(b) Discuss about different epidemiological study designs.

6. (a) State the Mendelian laws of heredity. 7

Or

(b) Obtain the probability distribution of AB under random mating.
