[This question paper contains 3 printed pages.]

6069 *Your Roll No.....*

B.Sc. (Hons.)/III **B**

STATISTICS – Paper XXVI

BIOSTATISTICS

(Admissions of 1999 and onwards)

Time : 2 Hours *Maximum Marks : 38*

(Write your Roll No. on the top immediately on receipt of this question paper.)

Answer **four** *questions in all, selecting* **two** *questions from each Section.*

SECTION I

1. (a) Define Hazard function, survival function and death density function.

   Obtain survival function and death density function for both bath tub type survival model and Weibull survival model.

   (b) Define net probability of type A ($q_{i\delta}$) and establish the relation between $q_{i\delta}$ and crude probability ($Q_{i\delta}$). (6½,3)

2. (a) What is censoring? Describe Type II censoring scheme.

P.T.O.

(b) Assuming that each patient has death density function :

$$f(t) = \lambda \exp(-\lambda t),\ \lambda > 0,\ t \geq 0$$

and maximum likelihood estimator of mean longevity $\mu = \frac{1}{\lambda}$ based on type II censoring scheme is given by

$$\hat{\mu}\,\frac{Y}{d} = \frac{\sum_{i=1}^{d-1} t_{(i)} + (n - d + 1)t_{(d)}}{d},$$

where $t_{(1)} \leq t_{(2)} - - - \leq t_{(d)}$. Obtain the distribution of Y. Hence obtain mean and variance of $\hat{\mu}$. Show that $\hat{\mu}$ attains Cramer Rao lower bound for variance. (2,7½)

3. (a) Stating the assumptions explicitly, derive the logistic curve for population projection.

(b) Discuss method of three selected points for fitting logistic curve. (3½,6)

SECTION II

4. (a) Define simple stochastic epidemic model. Obtain the probability of n susceptibles at time t i.e. $p_n(t)$.

(b) What is duration of an epidemic ? For simple stochastic epidemic model, obtain the expression for rth cumulant of the duration of an epidemic. (5,4½)

5. (a) Define crude probability due to risk R_δ ($Q_{i\delta}$). Obtain the expression of $Q_{i\delta}$ stating the assumptions clearly.

(b) What is genotype and phenotype ? What are different types of phenotypic expressions of a heterozygote with respect to a single loci. (6,3½)

6. (a) Let A and B be two linked loci, each with two alleles. Let γ_1 = AB, γ_2 = Ab, γ_3 = aB and γ_4 = ab be four gametes with probabilities $g_i = P(\gamma_i)\ \forall\ i = 1, 2, 3, 4$ respectively. Obtain the segregation matrices C_1, C_2, C_3 and C_4 for the gametes γ_1, γ_2, γ_3 and γ_4 respectively.

(b) Describe Mendel's laws of heredily by giving example of crossing of two traits. Also, obtain the probabilities of dominant and recessive traits in second generation. (4,5½)