[This question paper contains 3 printed pages.]

2042 *Your Roll No.* .....

B.Sc. (Hons.) / III E

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.)

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

SECTION I

1. (a) Define hazard function $h(\cdot)$, survival function $s(\cdot)$ and death density function $f(\cdot)$. Establish

$$h(t) = \frac{f(t)}{s(t)}.$$

(b) Discuss bath-tub type survival model and obtain its survival function and death density function. (5, 4½)

P.T.O.

2. (a) Define net probability of type $B(q_i.\delta)$ and establish the relation between $q_{i\cdot\delta}$ and crude probability due to risk $R_\delta(Q_{i\delta})$. Prove the inequality $q_{i\cdot\delta} < Q_{i\delta}$.

(b) Discuss the method of partial sums to fit Makeham's graduation formula. What is the use of this formula ? (5,4½)

3. (a) Discuss the Pearl and Reed's method to fit logistic curve.

(b) What is censoring ? Differentiate between type I and type II censoring scheme. (6½,3)

SECTION II

4. (a) Define simple stochastic epidemic model. Obtain the probability of n susceptibles at time t, i.e., $p_n(t)$, when the initial population comprises of n susceptibles and 1 infective.

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

5. (a) Obtain the maximum likelihood estimator of mean longevity $\mu = \frac{1}{\lambda}$ based on progressive type I censored sample of n patients assuming that each patient has death density function $f(t) = \lambda e^{-\lambda t}$, $\lambda > 0,\ t \geq 0$.

(b) Describe Mendel's laws of heredity by giving example of crossing of two traits. (6,3½)

6. 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 $g_i = P(\gamma_i)$ for all 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. Hence obtain the distribution of genotypes in the n-th generation under random mating. (9½)