[This question paper contains 2 printed pages.]

1434 *Your Roll No.* .....

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

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** *from each Section.*

SECTION I

1. (a) Define crude probability due to risk R_δ $(Q_{i\delta})$. Stating the assumptions explicitly, obtain the expression of $Q_{i\delta}$.

   (b) Define hazard function $h(\cdot)$, survival function $s(\cdot)$ and death density function $f(\cdot)$. Show that

   $$s(t) = \exp\left\{-\int_0^t h(u)du\right\} \qquad (7,2\frac{1}{2})$$

2. (a) Discuss Rhodes method to fit a logistic curve.

   (b) Define net probability of type B $(q_{i\cdot\delta})$. Obtain relationship between $q_{i\cdot\delta}$ and crude probability.

   (6,3½)

P.T.O.

3. (a) Derive Makeham's graduation formula. What is its use ?

   (b) Discuss different types of censoring schemes. (5,4½)

SECTION II

4. Define simple stochastic epidemic model. Obtain the probability of r susceptibles at time t i.e. $p_r(t)$, for $r = 1, 2, \ldots, n$. (9½)

5. (a) Show that m.l.e. $\hat{\mu} = \dfrac{\sum_{i=1}^{d-1} t_{(i)} + (n - d + 1)\, t(d)}{d}$ is BLUE for μ, under type II censored sample of n patients. Here we assume that each patient has death density function $f(t) = \lambda \exp(-\lambda t)$, $\lambda > 0$, $t \geq 0$.

   (b) If two risks R_δ and R_ϵ $(\delta \neq \epsilon)$ are such that $Q_{i\delta} > Q_{i\epsilon}$, then show that :

   $$q_{i\delta} > q_{i\epsilon}$$ (7½,2)

6. (a) Define gametic and genotypic array. Prove that under random mating, genotypic array is the square of the gametic array.

   (b) State Hardy-Weinberg law. Establish that this law holds asymptotically for the case of overlapping generations. (2½,7)