

SEPTEMBER 2006

[KP 251]

Sub. Code : 2851

M.Sc. (Biostatistics) DEGREE EXAMINATION.

First Year

Paper I — PROBABILITY THEORY AND DISTRIBUTIONS

Time : Three hours Maximum : 100 marks

Descriptive : Two hours and forty minutes Descriptive : 80 marks

Objective : Twenty minutes Objective : 20 marks

Answer ALL questions.

1. (a) Prove that, if X and Y are mutually independent random variables with finite expectations, the their product is a random variable with finite expectation and $E(XY) = E(X) \cdot E(Y)$. (10)

(b) Explain the use of t-distribution in biostatistical inference. (10)

2. Let X be a random variable with distribution

X : 1 3 5 7

P(X = x) : 0.4 0.3 0.2 0.1

(a) Find the mean μ_X , variance σ_X^2 and standard deviation of σ_X of X..

(b) Find the distribution of the standardized random variable $Z = (X - \mu) / \sigma$ of X, and show that $\mu_Z = 0$ and $\sigma_Z = 1$. (15)

3. How will you estimate a mean vector and dispersion matrix of a multivariate distribution? (15)

4. Write short notes on : (6 x 5 = 30)

(a) Define the distribution function of a random variable. Show that it is non-decreasing, right continuous with $F(-\infty) = 0$ and $F(+\infty) = 1$.

(b) Explain convergence in probability and almost surely convergence. Show that the later implies the former.

(c) State the central limit theorem for i.i.d. (identically independently distributed) random variables. Mention its significance.

(d) Explain the log normal distribution. Explain briefly its properties and uses.

(e) Define p-variate normal distribution and state any two of its properties.

(f) Define Mahalanobis D^2 -statistic. Mention its uses.