This question paper contains **3** printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **8091**

Unique Paper Code : **2373010011**

Name of the Paper : **Biostatistics (NEP)**

Name of the Course : **B.Sc. (H) and B.A. (P)/B.Sc. (P)**

Semester : **VI**

Duration : **3 Hours** Maximum Marks : **90**

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

Attempt *six* questions in all.

Question No. **1** is compulsory.

Select *five* questions from the remaining questions.

Use of simple calculators is allowed.

1. (*a*) Define survival function and hazard function. Establish interrelationship between survival function and hazard function. Hence, find the survival function when $h(t) = c$.

   (*b*) Distinguish between crude probability of death and partially crude probability of death.

   (*c*) Define random mating. Explain genotype and phenotype. Distinguish between coupling and repulsion. 5,5,5

P.T.O.

2. (*a*) Define net probability of death. Using the method of modified minimum chi-square estimation obtain an estimate of net probability type B of death $q_i.\delta$.

(*b*) Construct the segregation matrix for the gamete Ab. Compute g_1, g_2, g_3 and g_4 for the second and fourth generation for $g_1 = 0.2$, $g_2 = 0.4$, $g_3 = 0.2$, $g_4 = 0.2$ and $\lambda = 0.4$. 8,7

3. (*a*) Using Kaplan Meier method, estimate the survival function and also obtain expression for variance of the estimate.

(*b*) Distinguish between survival function and survivability of a system. Construct a survival model in which hazard rate is constant. Plot survival curve and death density function curve for this distribution. Also find mean and variance of the survival time. 8,7

4. (*a*) What do you understand by bath tub type of survival model ? Obtain hazard function, death density function and survival function for this distribution.

(*b*) Explain Type II censoring with the help of an example. Under type II censored data estimate mean survival time assuming that the death density function of each patient follows exponential distribution. 7,8

5. (*a*) Define simple stochastic epidemic model. Obtain the probability of no infection up to time τ.

(*b*) If the remission time follows the Gamma distribution with scale parameter $\lambda = 1$ and shape parameter $\gamma = 0.5$, obtain the mean remission time and its variance. Also, obtain its coefficient of variation. 7,8

6. (*a*) Suppose there are two linked loci A and B, each with two alleles. Let λ be the recombination fraction. Suppose the gametic probabilities of initial population are $g_1 = P(AB) = P(\gamma_1)$, $g_2 = P(Ab) = P(\gamma_2)$, $g_3 = P(aB) = P(\gamma_3)$, $g_4 = P(ab) = P(\gamma_4)$. Obtain the four 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 the gametic output for the nth generation.

(*b*) What do understand by Competing Risk Theory ? Stating the Chiang's proportionality assumptions, obtain the crude probability of death due to risk R_δ. If $Q_{id} > Q_{ie}$ then prove that $q_{id} > q_{ie}$, where notations have their usual meanings. 8,7

7. Distinguish between :

(*a*) Dominant and Recessive Genes

(*b*) Coupling and Repulsion

(*c*) Genotype and Phenotype. 5,5,5