

AUGUST 2005

[KN 252]

Sub. Code : 2852

M.Sc. (Biostatistics) DEGREE EXAMINATION.

FIRST YEAR

Paper II — RESEARCH DESIGNS AND
BIostatistical INFERENCE - I

Time : Three hours Maximum : 100 marks

Sec. A & B : Two hours and Sec. A & B : 80 marks
forty minutes

Sec. C : Twenty minutes Sec. C : 20 marks

Answer Sections A and B in the SAME answer book.

Answer Section C in the answer sheet provided.

Answer ALL questions.

SECTION A — (2 × 15 = 30 marks)

1. Let T_1 and T_2 be unbiased estimators of $r(\theta)$ with efficiencies e_1 and e_2 respectively and $\rho = \rho_\theta$ be the correlation coefficient between them

$$\sqrt{e_1 e_2} - \sqrt{(1-e_1)(1-e_2)} \leq \rho \leq \sqrt{e_1 e_2} + \sqrt{(1-e_1)(1-e_2)}.$$

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2. Respiratory rate (breaths per minute) was measured in eight experimental animals under three levels of exposure to carbonmonoxide. The results were as follows

	Exposure level		
	Animal Low	Moderate	High
1	36	43	45
2	33	38	39
3	35	41	33
4	39	34	39
5	41	28	33
6	41	44	26
7	44	30	39
8	45	31	29

Can one conclude on the basis of these data that the three exposure levels, on the average, have a different effect on respiratory rate? Let

$\alpha = 0.05$. Determine the P value.

SECTION B — (10 × 5 = 50 marks)

3. (a) Give an example of an estimator :
- (i) Which is consistent but not unbiased?
 - (ii) Which is unbiased but not consistent?

(b) Obtain 100 $(1-\alpha)\%$ confidence limits for the parameter of the Poisson distribution.

(c) If \hat{T} is an unbiased estimator of a parameter, based on random sample of size n , prove that

$$\text{Var}(\hat{T}) \geq 1/K_n I(\theta), \text{ where } I(\theta)$$

is the information function.

- (d) Describe the completely randomised design.
- (e) Write down the basic principles for a good experimental design.
- (f) State and explain the importance of random sampling.
- (g) Explain briefly the role of replication, randomization and local control in the field experiments.
- (h) Examine the factor which determines the sample size.
- (i) Explain Likelihood ratio test. Under what circumstances would you recommend this test?
- (j) Discuss the concept of interval estimation and provide suitable illustration.