



**EASTERN UNIVERSITY, SRI LANKA**

**FIRST EXAMINATION IN SCIENCE (2003/2004)**

**SECOND SEMESTER**

**June/July 2005**

**CC 103 BIO-MATHEMATICS AND BIO-STATISTICS**

**(Proper & Repeat)**

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**Answer all questions**

**Time: Two hours**

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1. Give precise, complete, and unambiguous definitions of the following statistical terms, with examples if necessary.
- (i) Population
  - (ii) Probability
  - (iii) Sample space
  - (iv) Mutually Exclusive event
  - (v) Range
  - (vi) Permutation
  - (vii) Alternative Hypothesis
  - (viii) Student's distribution
  - (ix) Confidence level
  - (x) Central limit theorem

2. (a) Summarize your knowledge about the following in relation to biostatistics with examples, if necessary:

- i. Skewness,
- ii. Normal Distribution,
- iii. SPSS.

(b) Distinguish between the following within each pair:

- i. Primary Data and Secondary Data,
- ii. Cartogram and Pictogram,
- iii. Mathematical Average and Positional Average,
- iv. Standard Deviation and Variance.

3. (a) Simplify each of the following:

i. 
$$\left( \frac{x^2 - xy}{xy + y^2} \div \frac{x^2 - y^2}{x^2 + 2xy + y^2} \right) \div \frac{x^2 - 2xy + y^2}{x^2y - xy^2},$$

ii. 
$$\frac{(25)^{\frac{2}{3}} \times \sqrt{(64)^{\frac{1}{3}} \times 3^3 \times (-8)^{\frac{2}{3}}}}{(125)^{\frac{1}{3}} \times (27)^{\frac{1}{6}} \times (2)^{\frac{1}{3}}}.$$

(b) Factorize the following:

i.  $x^4 + x^2y^2 - 2y^4,$

ii.  $20a^2b^2 - 45.$

(c) Solve the following equations:

i.  $4^x - 10(2^x) + 16 = 0,$

ii.  $10(2x + 1)^{-2} - 7(2x + 1)^{-1} + 1 = 0.$

(d) Prove that  $\log_a mn = \log_a m + \log_a n$ , where  $m, n$  are positive integers

Hence show that

$$2 \log_a(x + y) = 2 \log_a x + \log_a \left( 1 + \frac{2y}{x} + \frac{y^2}{x^2} \right).$$



4. (a) Find the limit value of the following:

i.  $\lim_{x \rightarrow 3} \frac{x^2 - 3x}{x^2 - 9}$ ,

ii.  $\lim_{x \rightarrow \infty} \frac{x^2 + 3x}{2x^2 + 5}$ ,

iii.  $\lim_{x \rightarrow 0} \frac{1 - \sqrt{1 - x^2}}{x^2}$ .

(b) Differentiate the following with respect to  $x$ :

i.  $y = x \ln x^2$ ,

ii.  $y = \frac{(x + 1)^2}{\sqrt{1 + x^2}}$

(c) Find the turning points of the function  $y = x^3 - 3x^2 + 5$ , and comment on these points.

(d) Integrate the following:

i.  $\int \frac{1 + x \ln x}{x} e^x dx$ ,

ii.  $\int \frac{1 + x}{3 - 2x - x^2} dx$ .