EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS
FIRST EXAMINATION IN SCIENCE -2008/2009
FIRST SEMESTER (Mar./May, 2010)
CC 103 - BIO MATHEMATICS

Answer all Questions **Time: One hour**

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1. (a) (i) Which of the following are rational numbers?

$-8\frac{1}{4},\ -\sqrt{3},\ -1.67,\ 0,\ \sqrt{13},\ 4\frac{1}{2},\ 8.33$

(ii) Are all numbers with infinite decimals is irrational? Justify your answer.

(20 Marks)

(b) (i) Simplify $2\log x + \log\left(1 + \frac{2y}{x} + \frac{y^2}{x^2}\right)$.

(ii) If $x = \sqrt{\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}}$ then find $x + \frac{1}{x}$.

(iii) If $2\sin(A+B) = \sqrt{3}$ and $\sqrt{2}\cos B = 1$ then find A and B. (35 Marks)

(c) Solve the following equations:

(i) $\frac{4}{x-1} - \frac{6-3x}{x(x-1)} = 2 - \frac{2x-3}{x}$;

(ii) $2(2^{2x}) - 5(2^x) + 2 = 0$;

(iii) $\log_3\sqrt{10x+5} - \frac{1}{2} = \log_3\sqrt{x+1}$. (45 Marks)

2. (a) Evaluate the following:

(i) $\lim_{x\to 0} \frac{\sqrt{x+25}-5}{x}$;

(ii) $\lim_{x\to\infty} \frac{3^x - 3^{-x}}{3^x + 3^{-x}}$. (20 Marks)

(b) (i) Find $\frac{dy}{dx}$ if $y = \ln\left(\frac{x^2}{\sqrt{4-x^2}}\right)$.

(ii) If $z = e^{ax}\sin bx$ then prove that

$$\frac{d^2z}{dx^2} - 2a\frac{dz}{dx} + (a^2+b^2)z = 0,$$

where a and b are constants.

(iii) If $y = \dfrac{u-1}{u+1}$ and $u = \sqrt{x}$ then find $\dfrac{dy}{dx}$. (40 Marks)

(c) Evaluate the following:

(i) $\displaystyle\int \frac{x^2+2}{x^3+x^2-2x}\,dx;$

(ii) $\displaystyle\int \frac{1}{x}(\ln x)^2\,dx;$

(iii) $\displaystyle\int_0^1 x\ln(x+3)\,dx.$ (40 Marks)