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EASTERN UNIVERSITY, SRI LANKA
DEPARTMENT OF MATHEMATICS
FIRST EXAMINATION IN SCIENCE - 2012/2013
FIRST SEMESTER (FEB./MAR., 2015)
CC 103 - BIO MATHEMATICS
(PROPER AND REPEAT)

Answer all questions

Time: One hour

1. (a) Simplify the following equation:

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

[20 marks]

- (b) Solve the following equation for x :

$$\log_3(x) - \log_3(x - 2) = \log_3(x - 3)$$

[20 marks]

- (c) Prove the trigonometric identity:

$$\sin 3\alpha = 3 \sin \alpha - 4 \sin^3 \alpha$$

(Hint: $\sin(\alpha + \beta) = \sin\alpha \cos\beta + \cos\alpha \sin\beta$)

[20 marks]

- (d) The straight line XY goes perpendicularly through the mid point of line AB that goes through the two points $A=(2, 5)$ and $B=(6, 25)$. Find the equation of the straight line XY .

[20 marks]

- (e) Find the inverse of the matrix $A = \begin{pmatrix} 4 & 3 \\ 1 & 1 \end{pmatrix}$.

[20 marks]

(P. T. O.)

2. (a) Find the limit of the following:

$$\lim_{x \rightarrow \sqrt{3}} \frac{x^2 - 3}{x - \sqrt{3}}$$

[10 marks]

- (b) Find the first derivatives of the function:

$$y = (x^2 - 4x - 5)(\sin x \cos x).$$

[20 marks]

- (c) Evaluate the integral:

$$\int \frac{7x + 7}{\sqrt{x}} dx.$$

[20 marks]

- (d) If $z_1 = 2 + 3i$, $z_2 = 3 - 3i$, and $z_3 = 2i$, find the value of:

$$\frac{z_1(z_2 + z_3)}{z_3 - z_2}.$$

[20 marks]

- (e) Find the stationary points of the following function, if any:

$$y = x^3 + 6x^2 - 15x - 24.$$

[30 marks]