EASTERN UNIVERSITY, SRI LANKA

FIRST YEAR FIRST SEMESTER EXAMINATION IN AGRICULTURE – 2006/2007

AEN 1103 – BASIC MATHEMATICS (1:15/00)

Time allowed: One hour

Answer all questions

Q1. a) (i) Solve the following equation:

$$\log_4(\log_3(x)) = 1.$$

(ii) Prove that,

$$\cos x + \sin y \sin(x - y) = \cos y \cos(x - y).$$

b) Find the values of the following limits:

(i) $\lim\limits_{x \to 5} \dfrac{(x^3 - 25x)}{(x - 5)}$;

(ii) $\lim\limits_{x \to -2} \dfrac{x^3 + 8}{x + 2}$.

c) Differentiate the following functions:

(i) Using power rule

$$y = \frac{8}{(3x^2 + 6x)^2};$$

(ii) Using product rule

$$y = (6x^2 + 3)(3x + 9);$$

(iii) Using quotient rule

$$y = \frac{\cos x}{x}.$$

Q2. a) An open tank is to have a horizontal square base and vertical sides. Its volume is to be **60** m^3. The cost of lining the base is p/m^2, and the cost of lining the sides is q/m^2, where p and q are constants. Let the square base be of side x m and height y m.

(i) Express the cost for lining the base, in terms of the given data.

(ii) Express the cost for lining the vertical sides, in terms of the given data.

(iii) What is the total cost required to line the whole tank?

(iv) At most economical dimensions (that is, when the dimensions of the tank are such that the total cost of lining it is a minimum), prove that

'***The cost of lining the sides*** = *Double the* ***cost of lining the base***'.

b) Find and classify the stationary points of the following function and give also the maximum and minimum values. $y = x^3 - 1.5x^2 - 6x + 10$.

c) Integrate the following functions with respect to x:

(i) $\int xe^{3x}\, dx$;

(ii) $\int x^3 (2x^4 + 1)\, dx$;

(iii) $\int (\sin 5x + 4x^3)\, dx$.