

BSc in Aquatic Resources Technology
BASC in Animal Science
First Year Second Semester Examination – December 2016 / January 2017

Mathematics for Biological Sciences (EAG 102-0)

Instructions:

Answer all questions in the given booklet.

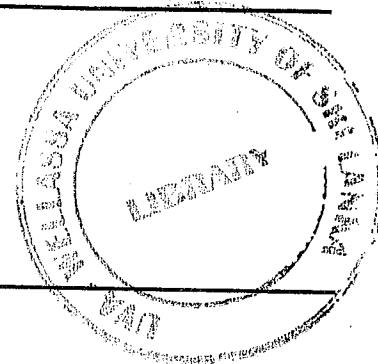
No. of questions : Four (04)

No. of pages : Two (02)

Time : Two (02) hours

Total marks allocated : 100%

Calculators are not allowed.



01. Consider the three (03) simultaneous equations given below;

a) $2x + y - z = 5$

b) $3y + x - z = 8$

c) $2z + 4x - 2y = -2$

- (I) Represent these equations in matrix form as $AX = B$ (Here A, X and B are matrices). (05 marks)
- (II) Find the determinant of matrix A. (05 marks)
- (III) Find the inverse of matrix A. (10 marks)
- (IV) Using inverse and determinant of matrix A, find the answers for x, y and z . (05 marks)

02.

- (I) A closed cylindrical "Can" has a surface area $120\pi \text{ cm}^2$ (including all three surfaces). Express the volume of the "Can" as a function of its radius r . (05 marks)
- (II) Draw the following graph in same Cartesian plane and state whether it is bijective function or not. (10 marks)

$$f(x) \begin{cases} -2 & x < -2 \\ -x^2 + 2 & -2 \leq x < 2 \\ x - 4 & 2 \leq x \end{cases}$$

(III) Find limits of the following functions.

a) $\lim_{x \rightarrow 5} \frac{x^2 - 3x + 2}{x + 5}$ (02 marks)

b) $\lim_{x \rightarrow 2} \frac{2x^2 - 8x + 8}{x^2 - 4}$ (03 marks)

c) $\lim_{x \rightarrow 0} \frac{\sqrt{x+1} - 1}{x}$ (05 marks)

03.

(I) Prove that $\frac{d}{dx} (x^2 + 3) = 2x$ using the definition of derivatives. (05 marks)

(II) Find the derivative of following functions given below with respect to x .

a) $y = x^5 - x^{-2} + 3x - 1$ (03 marks)

b) $y = e^{2x+1} \cdot \cos 2x^2$ (07 marks)

c) $y = \cot x$ (07 marks)

(III) Mr. Perera plans to construct a round shape pond in his farm. Construction cost (y) of that pond is depended on the radius (r) as mentioned below.

$$y = 2r^2 - 16r + 23$$

Find the radius (r) which gives the minimum construction cost. (08 marks)

04. Integrate the following functions with respect to x .

(I) $\int x^3 - x^{-2} + 2 dx$ (05 marks)

(II) $\int (x^2 + 2x)^5 dx$ (05 marks)

(III) $\int_0^{\pi/2} \cos x + \sin x dx$ (10 marks)

