# MASENO UNIVERSITY

## UNIVERSITY EXAMINATIONS 2017/2018

### FIRST YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE WITH INFORMATION TECHNOLOGY

**MAIN CAMPUS**

## CIM 103: BUSINESS MATHEMATICS

Date: 7th March, 2018                    Time: 12.00 - 3.00pm

**INSTRUCTIONS:**

- Answer Question ONE and any other TWO.

## QUESTION ONE (30MKS)

a) If $f(x) = x^3 + 4x - 3$ find $f(1)$, $f(-1)$, $f(0)$, $f(\sqrt{2})$ [4mks]

b) A company manufactures fuel tanks for cars. The total weekly cost (in dollars) of producing x tanks is given by; $C(x) = 10000 + 90x - 0.05x^2$ .Find

    i) Find the marginal cost function [2mks]

    ii) Find the marginal cost at a producing level of 500 tanks per week. [2mks]

    iii) Interpret the results of part (ii) [1mk]

    iv) Find the exact cost of producing the 501st item [3mks]

c) Evaluate the following limits; [6mks]

    i)

$$\lim_{x \to 2} \frac{x^3 + 2}{x + 1}$$

    ii)

$$\lim_{x \to \infty} \frac{5x^2 + 3x - 6}{2x^2 - 5x + 1}$$

d) A person deposits a sum of sh.10000 in the name of his new-born child. The rate of interest is 12% p.a. What is the amount that will accrue on the 20th birthday of the beneficiary if the interest is compounded monthly. [3mks]

e) Differentiate $6x^4 - 7x^3 + 3x^2 - x + 8$ with respect to $x$ [3mks]

f) Solve $4x^2 - 8x + 3 = 0$ [3mks]

g) $\int \left(x - \frac{1}{x}\right)^2 dx$ [3mks]

## QUESTION TWO (20MKS)

a) Find the domain of the functions; [4mks]

   i)
   $$f(x) = \sqrt{3x - 5}$$

   ii)
   $$f(x) = \frac{x + 1}{x^3 - 9x}$$

b) Determine if $f$ is even, odd or neither [4mks]

   i) $f(x) = 3x^3 - 4x$ ,

   ii ) $f(x) = 7x^4 - x^2 + 7$

ii) If $f$ and $g$ are defined by $f(x) = x - 2$ and $(x) = 5x + \sqrt{x}$ , find $(gof)(x)$. Hence find $f(g(2))$ [4mks]

c) At what rate percent p.a. compound interest will sh.2000 amount to sh.3000 in three years if the interest is reckoned half yearly [4mks]

d) What sum will amount to sh.5525 at 10% compounded yearly for 13 years. [4mks]

## QUESTION THREE(20MKS)

a) Find the derivative of [6mks]

   i) $y = 3x^{\frac{2}{3}} - 2lnx + e^x$

   ii) $y = \frac{x^2+x+1}{x^2-x+1}$

b) A company manufactures automatic transmissions for cars. The total weekly cost (in dollars) of producing x transmissions is given by

   i) Find the marginal cost function [3mks]

   ii) Find the marginal cost at a producing level of 200 transmission per week. [2mks]

iii) Interpret the results of part (b) [1mk]

iv) Find the exact cost of producing the 201$^{st}$ transmission. [3mks]

e) How long will it take for a given sum of money to triple itself at 13% compound interest [3mks]

d) Find the amount of annuity of sh.2000 payable at the end of each year for 4 years if money is worth 10% compounded annually. [3mks]

## QUESTION FOUR (20MARKS)

**a).** What do you understand by the following terms: [3mks]

  i) Decision analysis
  ii) Expected value criterion
  iii) Decision tree

**b).** Consider the details of two competing alternatives as shown in the table below. Find the best alternative. [4mks]

Annual Revenue of Alternative

| **Alternative 1** | | **Alternative 2** | |
|---|---|---|---|
| Annual revenue(sh.) probability | probability | annual revenue | (sh.) |
| 300000 | 0.3 | 400000 | 0.1 |
| 400000 | 0.4 | 500000 | 0.5 |
| 500000 | 0.3 | 600000 | 0.4 |

**c).** A manager has a choice between A risky contract promising sh. 7 million with probability 0.6 and sh. 4 million with probability 0.4 and a diversified portfolio consisting of two contracts with independent outcome each promising sh.3.5 million with probability 0.6 and sh. 2 million with probability 0.4

  i) Construct a decision tree [3mks]
  ii) Using expected value criterion find the best alternative. [4mks]

d) Find the amount of an ordinary annuity of 12 monthly payment of sh.1000 that earns interest at 12% p.a. compounded monthly. [3mks]

e) What is the present value of annuity of sh.750 p.a. received at the end of each year for 5 years when the discount rate is 15%. [3mks]

## QUESTION FIVE (20MKS)

a) Evaluate $\int_1^2 6x^2 + 8x + 4dx$ [3mks]

b) Given $f(x,y) = 2x^2 + y^2 + 8x - 6y + 20$ determine

   i) $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ at point (1,2) [4mks]

   ii) Critical point [4mks]

   iii) nature of the critical point [5mks]

c) The marginal cost for producing x units of a commodity is given by the formula $\frac{\partial c}{\partial x} = 32 - 0.04x$. It cost sh. 1000 to make one unit, find the cost of 200 units. [4mks]