# MASENO UNIVERSITY

## UNIVERSITY EXAMINATIONS 2017/2018

FIRST YEAR FIRST SEMESTER EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY

## MAIN CAMPUS

## CIT 103: MATHEMATICS FOR IT

Date: 22nd February, 2018 Time: 8.30 - 11.30 am

**INSTRUCTIONS:**

- Answer ALL questions in SECTION A and any other TWO from SECTION B
- Write your registration number on all sheets of the answer book used.
- Use a NEW PAGE FOR EVERY QUESTION attempted, and indicate number on the space provided on the page of the answer sheet.

## SECTION A: COMPULSORY

### QUESTION ONE (30 MARKS)

a) Define the following terms (4 Marks)

(i) Function

(ii) Logic

(iii) Derivative

(iv) A tree

b) Evaluate $\lim_{x\to 1}\frac{x-1}{x^2-1}$ (3 Marks)

c) If $x^2+y^2=25$, find $\frac{dy}{dx}$ at the point (3,4) (4 Marks)

d) Find the area between the line $y=x-1$ and the parabola $y^2=2x+6$ (5 Marks)

e) Show that the following propositions are logically correct

$$P \leftrightarrow\equiv (P\rightarrow Q)\Lambda(Q\rightarrow P)$$ (4 Marks)

f) Use a tree diagram to display all the different odd non repeating three digit numbers that can be written using digits from the set [0, 1, 2, 3] (5 Marks)

g) Find the volume of the solid of revolution formed by revolving the region bounded by $y=x-x^3$ and the x-axis $(0\le x\le 1)$ about the $y$-axis (5 Marks)

## SECTION B: ANY TWO QUESTIONS IN SECTION B

### QUESTION TWO (20 MARKS)

a) Differentiate between odd and even functions. (2 Marks)

b) Let $f(x)=\sqrt{x}$ and $g(x)=\sqrt{2-x}$, find $f\circ g$ and its domain (4 Marks)

c) Find the inverse of the function $f(x)=x^3+2$ (3 Marks)

d) Evaluate $\lim_{x\to 0}\frac{\sqrt{x+1}-1}{x}$ (5 Marks)

e) Determine the slope of the graph of $3(x^2+y^2)^2=100xy$ at the point (3,1) (6 Marks)

## QUESTION THREE (20 MARKS)

a) Define the following terms (3 Marks)

(i) Set

(ii) Relation

(iii) Tautology

b) Given $U = \{x : 1 \leq x \leq 10, x \text{ is an integer}\}$, A=the set of odd numbers, B={the set of factors of 24} and C={3,10}

(i) Draw a venn diagram to show the relationship (3 Marks)

(ii) Using the venn diagram or otherwise find ; (3 Marks)

(a) $(A \cup B \cup C)'$ (b) $AUC$

c) Show that the following propositions are logically equivalent

(i) $\neg(p \rightarrow Q) \equiv P \wedge \neg Q$ (3 Marks)

(ii) $\sim (P \wedge Q) \neq \sim P \wedge \sim Q$ (3 Marks)

d) Out of 40 students, 14 are taking English and 29 are taking Chemistry. Using a venn diagram, how many are in either class. (5 Marks)

## QUESTION FOUR (20 MARKS)

a) State the fundamental theorem of calculus (2 Marks)

b) Find the area of the region between $f(x) = 3x^3 - x^2 - 10x$ and $g(x) = -x^2 + 2x$ (4 Marks)

c) Evaluate $\int \frac{dx}{\sqrt{4x^2 + 1}}$ (5 Marks)

d) Determine the slope of the graph of $3(x^2 + y^2)^2 = 100xy$ at the point (3,1) (5 Marks)

e) Find the volume of the solid obtained by rotating about the y-axis the region between $y = x$ *and* $y = x^2$ (4 Marks)

## QUESTION FIVE (20 MARKS)

a) Evaluate $\lim_{x \to \infty} \frac{3x - 1}{4x + 1}$ (3 Marks)

b) Differentiate the following function $y^2 = x^2 + \sin xy$ (5 Marks)

c) Using the first principle of differentiation, find the derivative of $y = \sqrt{x^2 + 1}$ (3 Marks)

d) Air is being pumped into a spherical balloon at the rate of $4.5m^3$/minute. Find the rate of the change of the radius, when the radius is 2m. (4 Marks)

e) Analyze the graph of $f(x) = \dfrac{x^2 + 1}{x^2 - 4}$ (5 Marks)