



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

QUALIFICATION: Bachelor of Science; Bachelor of Science in Applied Mathematics and Statistics	
QUALIFICATION CODE: 07BSOC; 07BAMS	LEVEL: 6
COURSE CODE: CLS601S	COURSE NAME: CALCULUS 2
SESSION: JUNE 2022	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER	Mr F.N. NDINODIVA, MR. T. KAENANDUNGE
MODERATOR:	Dr S.N. NEOSSI-NGUETCHUE

INSTRUCTIONS
<ol style="list-style-type: none">1. Answer ALL the questions in the booklet provided.2. Show clearly all the steps used in the calculations.3. All written work must be done in blue or black ink and sketches must be done in pencil.

PERMISSIBLE MATERIALS

1. Non-programmable calculator without a cover.

THIS QUESTION PAPER CONSISTS OF 3 PAGES (Including this front page)

Question 1 (26 Marks)

Use any appropriate method to find each of the following integrals:

1.1 $\int \sqrt{\frac{1}{4x^2 + 12x + 9}} dx$ [6]

1.2 $\int \frac{dx}{x - x^2}$ [4]

1.3 $\int \sec^5 x \sin^3 x dx$ [5]

1.4 $\int \frac{dx}{3 \sin x + 4 \cos x}$ [11]

Questions 2 (28 marks)

2.1 Given $f(x) = x^2 + 5x + 16$, find the x value of the average value on $[0, 2]$. [8]

2.2 Let $h(x) = \int_x^{x^2} \frac{dt}{t - t^2}$. Find $\frac{dh}{dx}$. [5]

2.3 The parametric equation of a curve is $y = 3t - t^2$, $x = 3t^2$. Find the volume generated when the plain figure bounded by the curve, the x -axis and the ordinates $t = 0$ and $t = 2$, rotates about the x -axis through a complete revolution. [7]

2.4. Find the area generated when the arc of the parabola $y^2 = 8x$ between $x = 0$ and $x = 2$, rotates about the x -axis. [8]

Question 3 (46 Marks)

3.1 Consider $f(x) = \frac{1}{1 + x^5}$.

3.1.1 Express $f(x)$ as a sum of a power series and find the interval of convergence. [7]

3.1.2 Use your answer in 3.1.1 to evaluate $\int \frac{dx}{1 + x^5}$. [5]

3.2 Find the Maclaurin series of $\sin x$ and prove that it represents $\sin x$ for all x . [11]

3.3 Given the cycloid $x = r(\theta - \sin \theta)$, $y = r(1 - \cos \theta)$. Find $\frac{d^2y}{dx^2}$. [8]

3.4 At what points is the tangent in 3.3 vertical? [5]

3.5 Determine the following polar coordinate in cartesian form:

$(\sqrt{2}, \frac{5\pi}{4})$. [5]

3.6 Consider a curve with a polar equation $r = 2 \cos \theta$. Find a cartesian equation for this curve and state what curve is represented by $r = 2 \cos \theta$. [5]

End of the exam.....good luck