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: JULY 2022	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

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

INSTRUCTIONS	
	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 (20 Marks)

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

1.1 $\int \dfrac{\cos \sqrt{x} \sin \sqrt{x}}{\sqrt{x}} dx$ [4]

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

1.3 $\int \ln x\, dx$ [4]

1.4 $\int \sin^2(2x) \cos(3x)\, dx$ [8]

Questions 2 (35 marks)

2.1   Consider a function $f(x) = x^2 - 6x,\ x \in [0,3]$.

     2.1.1   Use the fundamental theorem of calculus to evaluate the integral of the function over the given interval.   [3]

     2.1.2   Evaluate the Riemann sum for the function taking sample points to be right end points with n subintervals.   [10]

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

2.3   Find the area of the region enclosed by $f(x) = \sqrt{\dfrac{1}{4x^2 + 12x + 9}}$, on $[0,3]$.   [8]

2.4   Determine the length of the curve $x = 2\cos^3 \theta,\ y = 2\sin^3 \theta$ between the point corresponding to $\theta = 0$ and $\theta = \dfrac{\pi}{2}$.   [9]

Question 3 (45 Marks)

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

     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 $\int \dfrac{dx}{1 + x^5}$.   [5]

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

3.3 Approximate the function $f(x) = \sqrt{x}$ by a Tylor polynomial of degree 2 centered at 4. [5]

3.4 Find the equation of the tangent to the cycloid $x = r(\theta - \sin\theta)$, $y = r(1 - \cos\theta)$ at the point where $\theta = \dfrac{\pi}{3}$. [7]

3.5 At what points is the tangent in 3.4 horizontal? [4]

3.6 Determine the following cartesian coordinate in polar form:

$(-2, -2)$. [6]

End of the exam...........................good luck