NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH AND APPLIED SCIENCES

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: NOVEMBER 2019	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS: 100**

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER	Dr N. CHERE
MODERATOR:	Dr V. KATOMA

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)

1.1. Determine whether the following sequence converges or diverges. If it converges, determine where it converges.

1.1.1. $\left\{\frac{n}{n+1}\right\}_{n=1}^{\infty}$ [4]

1.1.2. $\left\{\frac{n^3+n+1}{n^2+2n}\right\}_{n=1}^{\infty}$ [4]

1.1.3. $\left\{(-1)^n \frac{1}{\sqrt{n}}\right\}_{n=1}^{\infty}$ [4]

1.2. Let f(x) = $\frac{1}{x}$. Then determine the second order Taylor polynomial approximation of f about x = 1. [5]

1.3. Let f(x) = $3x^2 + 2x + 1$. Then

1.3.1. find the average value of f on $[0, 2]$ [4]

1.3.2. find a point c on $[0, 2]$ that satisfy the Mean Value Theorem for Integrals. [5]

1.4. Evaluate the following indefinite integrals.

1.4.1. $\int (\ln x)^2 \, dx$ (use Integration by parts) [7]

1.4.2. $\int \tan^3 x \sec^4 x \, dx$ [6]

1.5. Use Integration by substitution to find $\int_1^{e^2} \frac{\cos(\ln x)}{x} \, dx$. [6]

1.6. Let F(x) = $\int_1^{x^2} \ln(t^2 + 1) \, dt$. Use the fundamental theorem of calculus to find $F'(x)$. [8]

1.7. Determine whether the following series converges or diverges. If it converges, find the sum.

1.7.1. $\sum_{k=1}^{\infty} 2^k 5^{1-k}$ [6]

1.7.2. $\sum_{k=1}^{\infty} \frac{1}{(k+1)(k+2)}$ [6]

1.8. Find the interval of convergence and radius of convergence for the power series

$\sum_{k=1}^{\infty} \frac{(x-5)^k}{3^k}$ [9]

1.9. Consider the region enclosed by the curves $x = y^2$, $y = x^2$. Then

1.9.1. Find the area of region enclosed by the curves $x = y^2$, $y = x^2$. [6]

1.9.2. Use the result in (1.9.1) to find the center of mass of the lamina enclosed by the region $x = y^2$, $y = x^2$. [7]

1.9.3. Find the volume of the solid generated when the region between the curves $x = y^2$, $y = x^2$ revolved about the y-axis. [6]

1.10. Use the Simpson's rule to approximate $\int_0^2 \sqrt{x^4 + 1}\ dx$ with n = 8. Write your answer in four decimal places. [7]

END OF EXAM.