CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF EDUCATION (SCIENCE, ARTS)

MATH 221: CALCULUS II

STREAMS: **TIME: 2 HOURS**

DAY/DATE: THURSDAY 13/12/2018 **8.30 A.M – 10.30 A.M**

INSTRUCTIONS:

Answer Questions ONE (compulsory) and any other TWO Questions

QUESTION ONE (COMPULSORY) (30MARKS)

a. Use Trapezoidal rule to approximate the value for the integral $\int_{2.1}^{3.6} f(x)\,dx$, using the empirical data in the table below
(4 Marks)

x	2.1	2.4	2.7	3.0	3.3	3.6
$f(x)$	3.2	2.7	2.9	3.5	4.1	5.2

b. Evaluate the following integrals
(3,2,3,3,2Marks)

i. $\int\left(2e^{x}+\frac{6}{x}+\ln 2\right)dx$

ii. $\int\left(x^{3}-2x^{2}\right)\left(\frac{1}{x}-5\right)dx$

iii. $\int\frac{2x^{4}}{x^{5}+1}dx$

iv. $\int x^2 e^{5x}\,dx$

v. $\int_0^{\pi} Sin\,t\;dt$

c. If $a>1$ and $\int_1^a \frac{x^3-1}{x^2}dx=1$, find the value of a (5 Marks)

d. Find the area bound by the lines $y=x+4, y=0\ and\ x=2$ (4Marks)

e. Show that $\int Tan\,\theta\;d\theta = \ln|Sec\,\theta|+C$
(3Marks)

QUESTION TWO (20MARKS)

a. Use partial fractions to evaluate the integral $\int \frac{2x+3}{x^2-9}dx$
(4 Marks)

b. State Rolle's Theorem and verify it for the function $y=x^3+x^2-3x+4$ in the interval $-1<x<2$
(8 Marks)

c. The velocity of a particle $t\sec$ after the start of movement is given as $(3t^2+4t+1)m/s^2$, find the velocity and the distance of the particle 3 seconds after the start of the movement given that when $t=0\ s=3m$
(8Marks)

QUESTION THREE (20MARKS)

a. Consider the function $f(x)=\sqrt{1+x^3}$

i. Tabulate to four decimal places the values of the function $f(x)=\sqrt{1+x^3}$ for values of x from 1 to 4 at an interval 0f 0.5
(2 Marks)

ii. Approximate $\int_1^4 \sqrt{1+x^3}dx$ using the Simpson's rule with $n=6$
(5 Marks)

b. Use appropriate substitutions to show that $\int 16xSin^3(2x^2+1)Cos(2x^2+1)dx = Sin^4(2x^2+1)+C$

(6 Marks)

c. Find the area between the curves of the functions $y=-x^2+4$ and $y=x^2-2x$ (6 Marks)

QUESTION FOUR (20MARKS)

$y=\frac{x^3}{3}$

a. Find the surface area of the solid generated by revolving the arc of the curve between $x=1$ and $x=2$ about the y-axis
(8Marks)

b. Determine the volume of the solid generated by rotating the region bounded by $y=x^3, x=o \, and \, y=8$

about the y-axis
(6Marks)

c. State the first fundamental theorem of integral Calculus and hence compute by the integration by parts method
(6 Marks)

$\int_{0.25\pi}^{\pi} Sin^2 \, x \, dx$

QUESTION FIVE (20MARKS)

a. Consider the two functions $y=3x+12 \; and \; y=x^2+2$ between $x=-2 \; and \; x=5$
   i. Determine the point of intersection of the two curves (4Marks)
   ii. Find the area enclosed by the curves between $x=-2 \; and \; x=5$ (5Marks)

b. Compute the integral $\int \frac{x-1}{2x-1} dx$ (5Marks)

c. Find the arc length of the function $f(x)=\frac{4}{3}x^{3/2}$ on the given the interval $[2,6]$ (6Marks)
