QUALIFICATION : **BACHELOR of SCIENCE**	
QUALIFICATION CODE: **07BOSC**	LEVEL: **6**
COURSE: **CALCULUS 2**	COURSE CODE: **CLS601S**
DATE: **NOVEMBER 2023**	SESSION: **1**
DURATION: **3 HOURS**	MARKS: **100**

FIRST OPPORTUNITY EXAMINATION: QUESTION PAPER

EXAMINER:	*Mr. Benson E Obabueki*
MODERATOR:	*Dr. David Iiyambo*

INSTRUCTIONS *(add other relevant instructions):*

1. Answer all questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the answer script. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.
6. Show all your working/calculation steps.

PERMISSIBLE MATERIALS:

1. Non-Programmable Calculator

ATTACHEMENTS

None

This paper consists of 2 pages excluding this front page

Question 1 (33 marks)

Determine each of the following indefinite integrals using only the indicated methods. Show all the working steps.

1.1 $\int (5x^2 + 2)\sin 2x\,dx$, by parts. (11)

1.2 $\int \frac{2x+1}{x(x^2-1)}\,dx$, by partial fractions. (9)

1.3 $\int \sqrt{\sin 2x}\cos 2x\,dx$, by substitution. (5)

1.4 $\int \frac{3}{\sqrt{16-4x^2}}\,dx$, by trigonometric substitution. (8)

Question 2 (21 marks)

2.1 Consider the function $f(x) = x^3 + 2x^2 + x + 1$. Find the quadratic interpolation polynomial $P_2(x)$ that interpolates f at the nodes $x_0 = -1$, $x_1 = 0$ and $x_2 = 1$. (11)

2.2 Determine the minimum value of n that will make the Simpson's rule approximation of $\int_0^3 (x^6 + x^5 + 2x + 8)\,dx$ correct to within an error of 0.001. (10)

Question 3 (35 marks)

3.1 Determine the area of the region enclosed by the graphs of the functions $f(x) = x^2 - 4$ and $g(x) = 4 - x^2$. (9)

3.2 Determine the volume of the solid generated when a plane figure bounded by $y = 5\cos 2x$, the x-axis, and the ordinates $x = 0$ and $x = \frac{\pi}{4}$, rotates about the x-axis through a complete revolution. (8)

3.3 A plane figure is enclosed by the parabola $y^2 = 4x$ and the line $y = 2x$. Determine

    3.3.1 the position of the centroid of the plane figure. (12)

    3.3.2 the centre of gravity of the solid formed when the plane figure rotates completely about the x-axis. (6)

Question 4 (11 marks)

4.1   Express $(-4, 3)$ in polar coordinate form.   (6)

4.2   Convert $r = \sin 2\theta$ to rectangular coordinates.   (5)

End of paper   **Total marks: 100.**