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QUALIFICATION : **BACHELOR of SCIENCE**	
QUALIFICATION CODE: **07BOSC**	LEVEL: **6**
COURSE: **CALCULUS 2**	COURSE CODE: **CLS601S**
DATE: **JANUARY 2024**	SESSION: **1**
DURATION: **3 HOURS**	MARKS: **100**

SECOND OPPORTUNITY / SUPPLEMENTARY EXAMINATION: QUESTION PAPER

EXAMINER: ***Mr. Benson E. Obabueki***

MODERATOR: ***Dr. David Iiyambo***

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 exam paper. 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

1. None

This paper consists of 2 pages excluding this front page

Question 1 (28 marks)

1.1 Determine the anti-derivative of $x^2 \sec^2(x^3)$ using the method of substitution. (6)

1.2 Determine the anti-derivative of $(3x+4)\sin x$ using integration by parts. (7)

1.3 Determine the anti-derivative of $\frac{x+2}{(x-1)(x+3)}$ using integration by partial fractions. (7)

1.4 Determine the integral $\int \frac{dx}{\sin x}$ using the t-formula. (8)

Question 2 (18 marks)

2.1 Consider the function $f(x) = x^4 + 2x^2 + 3$. 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 value of n to estimate the definite integral $\int_0^1 e^{x^2}\,dx$ within 0.001 accuracy using the trapezoidal rule. (7)

Question 3 (30 marks)

3.1 Determine the area of the region enclosed by the graphs of the functions $y = x^2$ and $y = -x^2 + 18x$. (8)

3.2 Calculate the length of the first quarter of the circle $y^2 + x^2 = 1$. (10)

3.3 Determine the area of the region generated when the arc of $y^2 = 12x$ between $x = 1$ and $x = 3$, is rotated completely about the x-axis. (12)

Question 4 (24 marks)

4.1 Find the volume of the solid formed when the plane figure bounded by $y = 5\cos 2x$, the x-axis and ordinates at $x = 0$ and $x = \frac{\pi}{4}$, rotates about the x-axis through a complete revolution. (6)

4.2 Determine the length of the arc of the curve $r = \cos^3(\frac{\theta}{3})$ between $\theta = 0$ and $\theta = 3\pi$.

Use $Arc\,length = \int_{\theta_1}^{\theta_2} \sqrt{r^2 + (\frac{dr}{d\theta})^2}\, d\theta$ (8)

4.3 Given the Maclaurin series $\cos x = \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n}}{(2n)!}$, write down the first four terms of $\cos x$. Hence estimate $\cos(0.2)$ using the sixth-degree Maclaurin polynomial. (10)

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