SIR ARTHUR LEWIS COMMUNITY COLLEGE
ACADEMIC YEAR (2024/2025) – SEMESTER TWO
END OF SEMESTER EXAMINATION

COURSE TITLE : **CALCULUS III**

COURST CODE : **MAT210**

LECTURER : **MR. JOHN ESTEPHANE**

DATE : **Monday 5th May, 2025**

TIME : **1.00 – 3.00 PM**

DURATION : **2 HRS**

STUDENT ID# : **…….**

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Write your student's ID number on all the work you hand in.
2. Answer all questions in the space provided.
3. Write in BLACK or BLUE pen***.*** ***(NO WRITING IN PENCIL)***
4. Show all calculations and working.
5. **Only NON-PROGRAMMABLE calculators are permitted**.
6. Do not use correction fluid.

Question	Student's mark	Moderated Mark	Max Score
1			7
2			7
3			5
4			9
5			5
6			9
7			9
8			10
9			12
10			7
TOTAL			**80**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

Instruction: Answer all questions in the space provided.

1. The Line L passes through the point $A(-2, 1, 3)$ and is parallel to $4i - 5j + 5k$. Find:

    a. The vector equation of L

    b. The parametric equation of L

    c. The Cartesian equation of L

2. Find the vector equation of a plane passing through a point (3, 4, 2) and is perpendicular to a line with direction cosines of (2, -3, 1).

3. Find the limit.

(a) $\lim_{t \to 2}(ti - 3j + t^2k)$

(b) $\lim_{t \to 2} \langle e^{t-1}, 4t, \frac{t-1}{t^2-1} \rangle$

4. Find the vector $r'(t_0)$

(a) $\vec{r}(t) = 2 \sin t \; i + j + 2 \cos t \; k; t_0 = \frac{\pi}{2}$

(b) $\vec{r}(t) = \langle \frac{t+1}{t-1}, \tan(4t), \sin^2 t \rangle ; t_0 = 0$

5. $\int (e^{-t}, e^{3t}, 3t^2) \, dt$

6. A surface S is defined by the cartesian equation $Z = x^2y + y^2x$. F Find the equation of the tangent plane on S at the point (1, 2, 6).

7. Let $E(x, y) = x^3 y \sin(xy^2)$. Find E_x, E_y, E_{xy} and E_{yy}

8. Find the critical points of $f(x, y) = 7x - 8y + 2xy - x^2 + y^3$

9. Use the method of Lagrange multipliers to find the minimum value of $f(x, y) = x^2 + 4y^2 - 2x + 8y$ subject to the constraint $x + 2y = 7$

10. $\int_0^2 \int_0^3 1 + (x-1)^2 + 4y^2 \, dx \, dy$

END OF EXAMINATION