TECHNICAL UNIVERSITY OF MOMBASA
FACULTY OF APPLIED AND HEALTH SCIENCES
DEPARTMENT OF MATHEMATICS AND PHYSICS
ASSIGNMENT
COURSE CODE/TITLE: AMA 4105: CALCULUS II

INSTRUCTIONS:

- **Form groups of 10 members.**

- **Ensure that you participate in doing all the questions below.**

- **Each group leader to rate participation of each member in a scale of 10 and write their score against their names and signatures on the cover page.**

SEMESTER: II   **SUBMISSION DATE: 30TH MARCH 2022**

1. Evaluate the following integrals using substitution method

   i.) $\int e^x \sqrt{1 + e^x} dx$ (4 marks)

   ii.) $\int \sin(ax + b) \, dx$ (4 marks)

   iii.) $\int t^{-1} \log_2 t \, dt$ (4 marks)

   iv.) $\int_{\frac{1}{4}}^{\frac{1}{2}} \frac{\cos(\pi t)}{\sin^2(\pi t)} \, dt$ (4 marks)

   v.) $\int_3^4 \frac{1}{(3x-7)^2} dx$ (4 marks)

2. Use integration by partial fractions method to evaluate the following integrals instruction

   i) $\int \frac{x^3}{(x-2)(x+3)} dx$ (6 marks)

   ii) $\int_0^2 \frac{2t}{t^2-t-2} dt$ (4 marks)

3. Use integration by parts to evaluate the following

   i.) $\int t \sin t \, dx$ (4 marks)

   ii.) $\int \sqrt{t} \ln t \, dt$ (4 marks)

4. Obtain the reduction formula for
   $I_n = \int x^n e^x \, dx$ and use it to evaluate $\int x^3 e^x \, dx$ (8 marks)

5. Find the length of an arc AB of the curve $y = \frac{2}{3} x^{\frac{3}{2}}$, where then coordinate of A and B are 3 and 8 respectively.   (5 marks)

6. Find the equation of motion for an object that moves along a straight line with constant acceleration a from an initial position x_0 with initial velocity v_0.   (4 marks)

7. The acceleration of an object is given by $a(t) = \cos(\pi t)$, and its velocity at time $t = 0$ is $1/(2\pi)$.

   Find both the net and the total distance traveled in the first 1.5 seconds. (5 marks)

8. Starting at time $t = 0$, an object moves along a straight line with the velocity
$$v(t) = 6 - 2t$$
   Calculate the displacement and the distance travelled by the object at time $t = 5s$. (5 marks)

9. Approximate $\int_2^3 \frac{dx}{x+1}$ using Simpson's Rule with $n = 4$. (5 marks)