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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2020/2021 ACADEMIC YEAR
FIRST YEAR, SECOND SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF EDUCATION (ARTS)

Date: 15th December, 2020
Time: 11.30am – 1.30pm

KMA 2201 - INTERGRAL CALCULUS

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

a) Evaluate the following integrals:

i) $\int \cos 5x \sin 3x dx$ (4 Marks)

ii) $\int x^2(1 + 4x^3)^3 dx$ (4 Marks)

iii) $\int x^2 e^{2x^3-4} dx$ (4 Marks)

b) Determine the area of the region enclosed by $y = x^2$ and $y = x + 6$ (5 Marks)

c) Identify the asymptotes in the function $y = \frac{x^2 + x - 1}{x - 1}$ (5 Marks)

d) The region bounded by the graph $x^2 = y - 2$, $2y - x^2 - 2 = 0$, $x = 0$, $x = 1$ is rotated 360° about the x - axis. Find the volume of the resulting solid (5 Marks)

e) The velocity of a moving point is given by the equation $v = (3t^2 + 2t + 1)m/s$. Find the path the point during 10 seconds from the start. (3 Marks)

QUESTION TWO (20 MARKS)

- a) Use Simpson's rule with 9 ordinates correct to 4 decimal places to estimate $\int_2^4 \frac{5 \ln 2x}{5 + \ln 2x} dx$ (8 Marks)
- b) Evaluate $\int \frac{\cos \sqrt{x}}{\sqrt{x}} dx$ (6 Marks)
- c) Evaluate $\int x^3 \sqrt{1-x^2} dx$ using
- i) integration by parts. (2 Marks)
 - ii) u-substitution. (2 Marks)
 - iii) trigonometric substitution. (2 Marks)

QUESTION THREE (20 MARKS)

- a) Find the integral $\int \sin^3 x dx$ (6 Marks)
- b) Find $\int \frac{1+x^2}{\sqrt[4]{3x+x^3}} dx$ (6 Marks)
- c) Find the area of the region bounded by the curve $y = xe^{-x}$ and the x-axis from $x = 0$ to $x = 4$ (5 Marks)
- d) i) State the mean value theorem (1 Mark)
- ii) Verify the mean value theorem for $4x^3 - 8x^2 + 7x - 2$ on $[2,5]$. (3 Marks)

QUESTION FOUR (20 MARKS)

- a) Evaluate $\int 2x^2 \sec(4\pi x^3 + 6) dx$ (5 Marks)
- b) Find $\int \frac{dx}{\sqrt{9-x^2}} dx$ (6 Marks)
- c) Use partial fractions to evaluate $\int \frac{x+4}{x^3+3x^2-10x} dx$ (6 Marks)
- d) Evaluate $\int_0^{\frac{\pi}{2}} (x+1) \sin x dx$ (3 Marks)

QUESTION FIVE (20 MARKS)

- a) Find $\int \frac{1}{1+\cos x} dx$ (3 Marks)
- b) Find $\int \frac{5x+7}{x^2+4x+8} dx$ (4 Marks)
- c) A glider is soaring upward along the helix $r(t) = (\cos t)i + (\sin t)j + tk$. How long is the glider's path from $t = 0$ to $t = 2\pi$ (8 Marks)
- Evaluate the integral $I = \int_0^1 \frac{dx}{1+x}$ using trapezoidal rule using 4 equal sub intervals (5 Marks)