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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) $\int x^2\left(1+4x^3\right)^3 dx$ (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 $y = \dfrac{x^2 + x - 1}{x - 1}$ (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 $\int 2x^2 \sec(4\prod x^3 + 6)dx$ (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 $\mathbf{t} = 0$ to $t = 2\prod$ (8 Marks)

Evaluate the integral I $= \int_0^1 \frac{dx}{1+x}$ using trapezoidal rule using 4 equal sub intervals .

(5 Marks)