MACHAKOS UNIVERSITY

University Examinations 2019/2020 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND YEAR SPECIAL /SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

SCO 210: INTEGRAL CALCULUS

DATE: 18/01/2021 **TIME: 8.30-10.30 AM**

INSTRUCTIONS

Answer ALL the questions in Section A and ANY TWO Questions in Section B

SECTION A

QUESTION ONE 30 MARKS (COMPULSORY)

a) Evaluate

$\int 3^x \ dx$ (5 marks)

b) Evaluate

$\int \frac{\cos\varphi}{2+sin\varphi} \ d\varphi$ (5 marks)

c) Integrate the following functions with respect to x

$y = \frac{dx}{4+9x^2}$ (5 marks)

d) Find the integrals of the following function with respect to x, $y = \frac{2x^2+1}{(x-1)(x+2)}$ (5 marks)

e) Evaluate the following integral using the given change of variable

$\int \frac{x(x-4)}{(x-2)^2}$, $u = x - 2$ (4 marks)

f) Evaluate the following definite integrals

$\int_0^{\pi} sin5xcos6x \ dx$ (3 marks)

g) Find the area enclosed by the curve $y = x^3 - 4x$ and the x-axis (3 marks)

SECTION B

QUESTION TWO 20 MARKS

Evaluate the following definite integrals

a) $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \sqrt{sec^2x - 1}dx$ (4 marks)

b) $\int_1^2 lnx\ dx$ (4 marks)

c) $\int_0^{\pi} cos^5 x\ dx$ (4 marks)

d) $\int_0^2 \frac{x^3-2x^2+1}{x^2-x} dx$ (4 marks)

e) $\int_0^2 x^4\sqrt{x^5+5}\, dx$ (4 marks)

QUESTION THREE (20 MARKS)

a) Find the area bounded by the $x = 9 - y^2$ and the y-axis (5 marks)

b) Find the volume of the solid generated by the region $y = x^2 + 1$, x-axis and the lines x=-1 and x=1, rotated 360° about the x-axis. (5 marks)

c) The region bounded by the y-axis, $y = x^3$ $y = 1\ and\ y = 8$ is rotated 360°about the y-axis. Find the volume of the resulting solid. (5 marks)

d) Find the volume generated by revolving the region bounded by $y = \sqrt{x}$, the lines $x = 1\ and\ x = 4$ about the line $y = 1$ (5 marks)

QUESTION FOUR (20 MARKS)

a) Integrate the following function with respect to x $\int cos4\varphi d\varphi$ (5 marks)

b) It took 20 seconds for a thermometer to rise from $10°F\ to\ 212°$F when it was taken from a freezer and placed in boiling water. Show that somewhere along the way the mercury was rising at exactly $10.1°F/sec$ (5 marks)

c) Given that $y = f(x) = x^3 - 7x + 6$

Find the intercepts (5 marks)

d) Evaluate the following integral

$\int e^{x^5} x^4\, dx$ (5 marks)

QUESTION FIVE (20 MARKS)

Using appropriate integration techniques evaluate

a) $\int x^2 e^x \, dx$ (5 marks)

b) $\int cos^4 \, x \, dx$ (5 marks)

c) $\int \frac{3}{\sqrt{3+2x-x^2}} \, dx \, from \, x = 0 \, to \, x = 5$ (5 marks)

d) $\int x^4 \, (7 - x^5)^3 \, dx$ (5 marks)