



MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

APRIL SESSION EXAMINATION FOR
BACHELOR OF EDUCATION (SCIENCE)

SMA 200: CALCULUS II

DATE: SCHOOL BASED

TIME:

INSTRUCTIONS TO CANDIDATES

Answer ALL the questions in Section A and ANY TWO Questions in Section B
SECTION A (COMPULSORY)

QUESTION ONE (30 MARKS)

a) Evaluate

$$\int 4^{\tan x} \sec^2 x \, dx \quad (5 \text{ marks})$$

b) Evaluate

$$\int \frac{1}{x^2 + x - 2} \, dx \text{ from } x = 3 \text{ to } x = 7 \quad (5 \text{ marks})$$

c) Integrate the following functions with respect to x

$$y = \tan^8 x \sec^2 x \quad (5 \text{ marks})$$

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

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

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

f) Evaluate the following definite integrals

$$\int_0^\pi \sin 3x \cos 4x \, dx \quad (3 \text{ marks})$$

g) Find the area bounded by the curve $y = 4 - x^2$ and the y-axis (3 marks)

SECTION B

QUESTION TWO 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 $y = 1$ (5marks)

QUESTION THREE 20 MARKS

Evaluate the following definite integrals

- i) $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \sqrt{\sec^2 x - 1} dx$ (4 marks)
- ii) $\int_1^2 \ln x \, dx$ (4 marks)
- iii) $\int_0^\pi \cos^5 x \, dx$ j (4 marks)
- iv) $\int_0^2 \frac{x^3 - 2x^2 + 1}{x^2 - x} dx$ (4 marks)
- v) $\int_0^2 x^4 \sqrt{x^5 + 5} \, dx$ (4 marks)

QUESTION FOUR 20 MARKS

- a) 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 $10.1^{\circ}\text{F}/\text{sec}$ (7 marks)
- b) Given that $y = f(x) = x^3 - 7x + 6$
Find the intercepts (7 marks)

- c) Evaluate the following integral

$$\int e^{x^5} x^4 dx \quad (6 \text{ marks})$$

QUESTION FIVE 20 MARKS

Using appropriate integration techniques evaluate

i) $\int \frac{1}{(x^2 \sqrt{x^2 + 4})} dx$ (5 marks)

ii) $\int \sin^5 x \cos^2 x dx$ (5 marks)

iii) $\int (2 - x)(x^2 - 4x + 4)^{-4} dx$ from $x = 0$ to $x = 5$ (4 marks)

iv) $\int \frac{(x^2 + 3x - 4)}{[(2x - 1)^2 (2x + 3)]} dx$ (6 marks)