



MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE
SECOND YEAR SECOND SEMESTER SUPPLEMENTARY EXAMINATIONS FOR
BACHELOR OF SCIENCE IN STATISTICS AND PROGRAMMING
BACHELOR OF ARTS IN MATHEMATICS AND ECONOMICS

SMA 200: CALCULUS II

DATE: 7/8/2019

TIME:

INSTRUCTIONS

Attempt question **one (compulsory)** and any other **two questions**.

Question 1 (30mks)

- a) Consider the region bounded by the equations $y = \sin x$ and $y = 0$ from the line $x = 0$ to $x = \pi$. Calculate the centroid (center of mass) of the region (3 marks)
- b) A particle carrying a positive electrical charge $+q$ is released at a distance d from an immovable positive charge $+Q$. calculate amount of work done on the particle as its distance increases to $2d$. (4 marks)
- c) Calculate the area bounded by the curve $y = \frac{1}{\sqrt{x}}$, x -axis and the line $x = 1$ (4 marks)
- d) Evaluate the improper integral $\int_{-\infty}^{\infty} \frac{1}{1+x^2} dx$ (4 marks)
- e) Determine
- i.) $\int x e^x dx$ (5 marks)
- ii.) $\int \frac{x+1}{\sqrt{x^2-x+1}} dx$ (5 marks)

Question2(20mks)

- a) Consider the integral $\int x^m (\log x)^n dx$
- i.) Obtain its reduction formula (6 marks)
- ii.) Use the formula obtained in (i) above to evaluate $\int x^4 (\log x)^3 dx$ (4 marks)
- b) Determine the approximate value for $\int_0^1 e^{-x^2} dx$ using trapezoidal rule by taking 10 equal intervals. (10 marks)

Question3(20mks)

- a) Work out the volume of the solid obtained by revolving the cardioide $r = a (1 + \cos \theta)$ about the initial line. (9 marks)
- b) Determine the distance travelled in a straight line by a particle in 6 sec given that the velocity v in m/s is connected with the time as follows. Sketch the time velocity graph. (11 marks)

t	0	1	2	3	4	5	6
v	10	12	15	16	11	5	3

Question 4(20mks)

Evaluate;

- i.) $\int \frac{x^4}{x^3 - 2x^2 - 7x - 4} dx$ (5 marks)
- ii.) $\int x \sec^2 x dx$ (5 marks)
- iii.) $\int x^2 \ln x dx$ (5 marks)
- iv.) $\int \sin^3 x dx$ (5 marks)

Question 5(20mks)

a.) Evaluate;

i.) $\int_0^{\pi} x \sin^6 x \cos^4 x \, dx$ (3 marks)

ii.) $\int_0^{\frac{\pi}{4}} \log(1 + \tan \theta) \, d\theta$ (6 marks)

b.) Compute $\int_0^1 \frac{\tan^{-1} x}{x^{\frac{3}{2}}} \, dx$ using Simpson's rule with 10 *equal* intervals. (11 marks)