



MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND YEAR SECOND SEMESTER EXAMINATIONS FOR

BACHELOR OF SCIENCE (MATHEMATICS AND COMPUTER SCIENCE)

BACHELOR OF SCIENCE (STATISTICS AND PROGRAMMING)

BACHELOR OF SCIENCE(MATHEMATICS)

BACHELOR OF ECONOMICS

BACHELOR OF EDUCATION

BACHELOR OF ARTS

SMA 200 CALCULUS II

DATE: 11/12/2017

TIME: 8.30-10.30 AM

INSTRUCTIONS : Answer question *one (compulsory)* and any other *two questions*.

QUESTION ONE (30 MARKS)

- a) Prove the definite integral property $\int_a^b f(x)dx = -\int_b^a f(x)dx$ (3 marks)
- b) Calculate the surface area of a sphere obtained by rotating $x^2 + y^2 = a^2$ between $x = -a$ and $x = a$ about the x -axis (4 marks)
- c) Determine the equation of a curve passing through the point (3,2) whose gradient is $5x^2 - x + 1$ at every point (x, y) (4 marks)
- d) Evaluate the improper integral $\int_{-\infty}^{\infty} \frac{1}{1+x^2} dx$ (4 marks)
- e) Determine

i.) $\int \frac{dx}{\sqrt{x^2 + 16}}$ (5 marks)

ii.) $\int e^{4x} \cos 2x \cos 4x \, dx$ (5 marks)

iii.) $\int_0^3 (2x + 3)^7 \, dx$ (5 marks)

QUESTION TWO (20 MARKS)

a) Consider the integral $\int \sin^n x \, dx$

i.) Obtain its reduction formula (4 marks)

ii.) Use the formula obtained in (i) above to evaluate $\int_0^{\frac{\pi}{2}} \sin^6 x \, dx$ (8 marks)

b) Calculate the area of the region bounded by the curves $y = 4x$ and $y = x^2$ (8 marks)

QUESTION THREE (20 MARKS)

a) A stone is thrown vertically upwards from the ground with an initial velocity of 64 ms^{-1} . Determine;

i) Time taken to reach maximum height (4 marks)

ii) Maximum height attained (3 marks)

iii) Velocity with which it strikes the ground (3 marks)

b) Work out the volume of the solid obtained by revolving the cardioid $r = a(1 + \cos \theta)$ about the initial line. (10 marks)

QUESTION FOUR (20 MARKS)

Evaluate;

a) $\int x^2 \ln x \, dx$ (4 marks)

b) $\int \sin^3 x \, dx$ (4 marks)

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

d) $\int x^4 e^{4x} dx$ (7 marks)

QUESTION FIVE (20 MARKS)

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 Trapezoidal rule with 10 *equal* intervals. (11 marks)