



MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING

DIPLOMA IN MECHANICAL ENGINEERING

DIPLOMA IN CIVIL ENGINEERING

MATHEMATICS IV

DATE 23/9/2019

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

Answer question **ONE** and any other **TWO** questions.

Show all your working.

QUESTION ONE (compulsory 30mks)

1. a) Evaluate

i) $\int \cos 6x \sin 2x \, dx$ (4 marks)

ii) $\int \sin^2 x \cos^2 x \, dx$ (6 marks)

iii) $\int \frac{5(x^2+x+3)}{x(x^2+2x+5)} \, dx$ (5 marks)

b) Integrate the following

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

ii) $\int \frac{x}{1+x^2} \, dx$ (5 marks)

ii) $\int_0^3 3x(3x^2 + 9)^{\frac{1}{2}} \, dx$ (5 marks)

QUESTION TWO (20 MARKS)

a) Proof that $\int \sqrt{(x^2 + a^2)} \, dx = \frac{a^2}{2} \left[\sinh^{-1} \frac{x}{a} + \frac{x}{a} \sqrt{(x^2 + a^2)} + c \right]$

(10 marks)

b) Use reduction formula to evaluate

i) $\int e^{5x} \sin 3x \, dx$ (5 marks)

ii) $\int x^3 e^{2x} \, dx$ (5 marks)

QUESTION THREE (20 MARKS)

a) Evaluate the definite integrals

i) $\int_0^\pi x^2 \sin x \, dx$ (5 marks)

ii) $\int_0^{\frac{\pi}{2}} \frac{1}{1+\cos x} \, dx$ (5 marks)

b) i) $\int \sin^2 x \, dx$ (4 marks)

ii) $\int \frac{5x^2 - x + 8}{(1-x)(1+x^2)} \, dx$ (6 marks)

QUESTION FOUR (20 MARKS)

Evaluate the integrals

i) $\int_0^4 \sqrt{16 - x^2} \, dx$ (10 marks)

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

iii) $\int \frac{2x}{\sqrt{1-x^2}} \, dx$ (5 marks)