



UNIVERSITY EXAMINATIONS 2019/2020 ACADEMIC YEAR

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

END OF SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL/MECHANICAL AND BUILDING AND CIVIL ENGINEERING

ECU 0200 MATHEMATICS IV CALCULUS II

Year 2 sem 1

sept -dec 2019

QUESTION ONE

(30mks)

a) Integrate

i) $\int \cos 6x \cos 4x \, dx$ (3mks)

ii) $\int \frac{1-3x}{(3x^2-2x)^2} \, dx$ (3mks)

iii) $\int \cos^2 5t \, dt$ (4mks)

b) Evaluate the definite integrals

i) $\int_0^3 \frac{1}{\sqrt{(x^2+9)}} \, dx$ (4mks)

ii) $\int_0^1 (2x-1)^6 \, dx$ (3mks)

iii) $\int_0^1 2te^{4t^2-3} \, dt$ (3mks)

c) Determine $\int \frac{1}{x^2-a^2} \, dx$ hence evaluate $\int_1^2 \frac{1}{x^2-9} \, dx$ (5mks)

d) obtain $\int \sin^4 \theta \cos^2 \theta \, d\theta$ (5mks)

QUESTION TWO (20MKS)

Integrate

i) $\int \frac{1}{2x^2+4x+26} \, dx$ (6mks)

ii) $\int \frac{2x-3}{(x-1)(x-2)(x+3)} \, dx$ (5mks)

iii) $\int \sin 5x \cos 3x \, dx$ (3mks)

iv) $\int \sin^4 x \cos^2 x \, dx$ (6mks)

QUESTION THREE (20MKS)

a) Evaluate the integrals

i) $\int_1^2 x e^x \, dx$ (3mks)

ii) $\int_1^\pi x^2 \sin x \, dx$ (8mks)

b) Use the reduction formula to integrate

$\int e^{5x} \sin 3x \, dx$ (6mks)

c) Given that $I = \int 8x^2 + 3x - 6x + 7 \, dx$ find the value of I at $x = 2$ if $I = 50$ (3mks)

QUESTION FOUR (20MKS)

Evaluate the integrals

i) $\int_0^2 \frac{x-1}{x(x+2)^2} \, dx$ (5marks)

ii) $\int_1^2 x e^x dx$ (5mks)

iii) $\int_0^2 \frac{1}{\sqrt{(16-x^2)}} dx$ (5mks)

iv) $\int_0^1 (2x-1)^6 dx$ (5mks)

QUESTION FIVE (20mks)

a) Show that $\int_0^{\frac{\pi}{2}} \frac{1}{1+\sin x} dx = 1$ (5mks)

b) Find the area bounded by the curve $y = 3x^2 - 6x + 5$ the x-axis and the ordinates $x = 1$ and $x = 3$ (5mks)

c) If $I_n = \int x^n e^{2x} dx$ show that $I_n = \frac{x^n e^{2x}}{2} - \frac{n}{2} I_{n-1}$ and hence evaluate

$\int x^3 e^{2x} dx$ (10mks)