



GARISSA UNIVERSITY COLLEGE

(A Constituent College of Moi University)

**UNIVERSITY EXAMINATION 2016/2017 ACADEMIC YEAR ONE
SECOND SEMESTER EXAMINATION**

SUPPLEMENTARY/SPECIAL EXAM

SCHOOL OF EDUCATION, ARTS AND SOCIAL SCIENCES

FOR THE DEGREE OF BACHELOR OF EDUCATION (ARTS)

COURSE CODE: MAT112

COURSE TITLE: INTEGRAL CALCULUS

EXAMINATION DURATION: 3 HOURS

DATE: 25/09/17

TIME: 2.00-5.00 PM

INSTRUCTION TO CANDIDATES

- The examination has SIX (6) questions
- Question ONE (1) is COMPULSORY
- Choose any other THREE (3) questions from the remaining FIVE (5) questions
- Use sketch diagrams to illustrate your answer whenever necessary
- Do not carry mobile phones or any other written materials in examination room
- Do not write on this paper

This paper consists of THREE (3) printed pages

Supplementary / special exam

1

please turn over

Good Luck – Exams Office



QUESTION ONE (COMPULSORY)

- (a) Evaluate $\int_1^4 (\sqrt{x} + \frac{1}{\sqrt{x}} + e^x) dx$ [4 marks]
- (b) Evaluate $\int \frac{4x^2}{x^3 - 7} dx$ [2 marks]
- (c) Express $\frac{4x + 5}{2x^2 + 5x + 2}$ in partial fractions. Hence solve $\int \frac{4x + 5}{2x^2 + 5x + 2} dx$ [4 marks]
- (d) Use integration by parts to evaluate $\int x^2 \cos x dx$ [4 marks]
- (e) Find the area bounded by the parabola $y = x^2 - 7x + 6$ and the x - axis [3 marks]
- (f) Find the volume of the solid generated by rotating about the x - axis the area in the first Quadrant enclosed by $y = x^2$, $y = 1$, $y = 4$ and the y - axis [4 marks]
- (g) Evaluate $\int_0^{\pi/4} \tan x dx$ by Simpson's rule using four strips [4 marks]

QUESTION TWO

- (a) Use appropriate substitution to evaluate $\int x^2 \sqrt{2x^3 + 1} dx$ [4 marks]
- (b) Express $\frac{x^2}{(x - 2)(x^2 + 1)}$ in partial fractions. Hence evaluate $\int \frac{x^2}{(x - 2)(x^2 + 1)} dx$ [6 marks]
- (c) Evaluate $\int e^x \cos x dx$ [5 marks]

QUESTION THREE

- (a) Evaluate $\int \sin^4 x dx$ [5 marks]
- (b) Use appropriate substitution to evaluate $\int \frac{dx}{2 \sin^2 x + 4 \cos^2 x}$ [6 marks]
- (c) Evaluate $\int \tan^{-1} x dx$ [4 marks]



QUESTION FOUR (15 Marks)

- (a) Use appropriate substitution to evaluate $\int \frac{dx}{5 + 4 \cos x}$ [5 marks]
- (b) Find the area bounded by the parabola $y^2 = 4x$ and line $y = 2x - 4$ [5 marks]
- (c) The area of the segment cut by $y = 5$ from the curve $y = x^2 + 1$ is rotated about the x - axis, find the volume generated. [5 marks]

QUESTION FIVE

- (a) Integrate by parts: $\int x^2 \ln x dx$ [3 marks]
- (b) Use integration by parts to evaluate $\int x^2 e^{3x} dx$ [5 marks]
- (c) If $I_n = \int x^n \cos x dx$, obtain a reduction for I_n in terms of I_{n-2} and hence determine $\int x^2 \cos x dx$ [7 marks]

QUESTION SIX

Show that $\int \frac{dZ}{Z^2 - A^2} = \frac{1}{2A} \ln \left| \frac{Z - A}{Z + A} \right| + C$. Hence evaluate $\int \frac{dx}{x^2 + 4x + 2}$ [7 marks]

- (a) Calculate the value of $4 \int_0^1 \frac{dx}{1 + x^2}$
- (i) By integration [3 marks]
- (ii) By Simpson's rule using five ordinates and thus find a value for π correct to 4 d.p.
Comment on the accuracy of your answer [5 marks]

