

GARISSA UNIVERSITY COLLEGE

(A Constituent College of Moi University)

UNIVERSITY EXAMINATION 2016/2017 ACADEMIC YEAR <u>ONE</u> <u>SECOND</u> 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

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- 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

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 = x², y = 1, y = 4 and the y axis [4 marks]
 (g) Evaluate ∫₀^{π/4} tan xdx 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]
Supplementary / special exam	2	Good Luck – Exams Office

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 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: $\int x^2 Inx dx$ [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]

