



GARISSA UNIVERSITY

UNIVERSITY EXAMINATION **2017/2018** ACADEMIC YEAR **TWO**
FIRST SEMESTER EXAMINATION

SCHOOL OF EDUCATION, ARTS AND SOCIAL SCIENCES

FOR THE DEGREE OF BACHELOR OF EDUCATION (ARTS)

COURSE CODE: MAT 210

COURSE TITLE: CALCULUS

EXAMINATION DURATION: 3 HOURS

DATE: 04/12/17

TIME: 09.00-12.00 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

please turn over



QUESTION ONE (COMPULSORY)

- (a) Use appropriate substitution to evaluate $\int_1^2 (3x - 2)^4 dx$ [4 marks]
- (b) Evaluate $\int \frac{2x^2}{x^3 - 3} dx$ [2 marks]
- (c) Express $\frac{x+1}{x^2 - 3x + 2}$ in partial fractions. Hence solve $\int \frac{x+1}{x^2 - 3x + 2} dx$ [4 marks]
- (d) Use integration by parts to evaluate $\int x \sin x dx$ [4 marks]
- (e) Find the area bounded by the parabola $y = x^2 - 5x + 4$ and the x - axis [3 marks]
- (f) Find the volume of the solid generated by rotating about the y - 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

- (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 $I_n = \int x^n \sin x dx$, obtain a reduction for I_n in terms of I_{n-2} and hence determine $\int x^3 \sin x dx$ [7 marks]

QUESTION SIX

- (a) Show that $\int \frac{dZ}{Z^2 - A^2} = \frac{1}{2A} \ln \left| \frac{Z - A}{Z + A} \right| + C$. Hence evaluate $\int \frac{dx}{x^2 - 10x + 18}$ [7 marks]
- (b) 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]

