

THE UNITED REPUBLIC OF TANZANIA
PRESIDENT'S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT



FORM SIX SPECIAL SCHOOLS SYNDICATE JOINT
EXAMINATION

141

BASIC APPLIED MATHEMATICS

Time: 3:00 Hrs

Friday 10-March-2023 PM

Instructions

1. This paper consists of **ten (10)** questions.
2. Answer **all** questions. Each question carries **ten (10)** marks.
3. **All** work done in answering each question must be shown clearly.
4. Non-programmable calculators and **NECTA** Mathematical tables may be used.
5. Cellular phones and any authorized materials are not allowed in the examination room.
6. Write your **Examination Number** on every page of your answer sheet(s).

This paper consists of 4 printed pages

Answer all questions.

1. (a) Use a non-programmable calculator to;

(i) Solve for $\int_e^{e^3} \frac{dx}{x(\log_e x)^2}$ correct to 4 significant figures.

(ii) Evaluate $\frac{\sqrt[5]{e^{\log \sqrt{3.6}} + \ln(\log 6)^2}}{\cos ec^{-1} 3}$ correct to 4 decimal places.

(b) (i) The population of Tunduma town is modeled by the equation $P(t) = P_0 e^{\lambda t}$ where

$\lambda = 0.034657$ per year. Use a non-programmable calculator set to whole number, find time t in years when the population in the town is three times the initial population.

(ii) Solve by using a calculator and write the possible values of p for the polynomial

equation $p^3 - 201p + 612 = 0$ correct to 1 decimal place.

2. (a) Express the following functions in the form of $f(x)$ and $g(x)$ from the given (i) $f \circ g(x) = \sqrt{x-7}$ (ii) $f \circ g(x) = \frac{3}{x-5}$

(b) Given that $f(x) = \frac{x}{x+1}$ and $g(x) = 9x - 3$ find $g^{-1} \circ f(x)$

(c) Sketch the graph of the function $f(x) = \frac{3x-5}{x-2}$ find (i) Asymptotes (ii) x and y – intercept (iii) State domain and range

3. (a) Consider two numbers such that, the second number minus one the result is three times the first number. If seven minus the square of the first number equals the second number subtracting twice the first number. Find the two unknown numbers.

(b) Six people working 8 hours a day takes 10 days to finish a certain job. How long will it take for two people working 12 hours per day to finish the same job?

(c) If you deposit Tsh. 5,000 into an account paying 6% annual interest compounded monthly, how long will it take until there is Tsh. 8,000 in the account?

4. (a) Give the derivative of $f(x) = \sin(x^4 - 2x + 3)$

(b) Given that $y = \sqrt{t} \sin \sqrt{t}$ and $t = \sqrt{x^2 + 1}$. Find $\frac{dy}{dx}$ in terms of t .

(c) Find the dimension of the rectangle with perimeter 1000m, so that the area of the rectangle is a maximum

5. (a) Integrate $\int \frac{3x^2 + 2}{(x^3 + 2x)^5} dx$ with respect to x .

(b) Evaluate the following; $\int_1^4 \left(\sqrt{x} + 4x^4 - \frac{5}{x^6} \right) dx$

(c) Find the total area enclosed by the curve $f(x) = 4x^2 - 1$ and the x - axis between $x = 0$ and $x = 1$

6. (a) The following table shows the distribution of marks on a final examination in Basic Applied Mathematics.

Marks	20-29	30-39	40-49	50-59	60-69
Frequency	2	5	13	16	9

By using coding method calculate mean and standard deviation. (Use Assumed mean = 44.5)

(b) Find 10th percentile and 90th percentile of the distribution.

7. (a) Define the following terms; (i) The sample space (ii) An event (iii) An impossible event

(b) In section B of CSEE Basic Mathematics Examination each candidate has to choose and answer four questions out of six questions. How many choices are there for each candidate?

(c) Given that events A and B are such that $P(A) = \frac{1}{2}$, $P(B) = p$ and $P(A \cup B) = \frac{3}{5}$, Find the value of p if A and B are (i) Mutual exclusive events. (ii) Independent events

8. (a) Calculate without using a calculating device;

(i) Given that α and β are two complementary angles and $\cos \alpha = \frac{\sqrt{3}}{2}$ find the value of $\sin \beta$.

(ii) Evaluate; $\frac{2 \tan 45^\circ}{\sec 60^\circ} + \frac{3 \operatorname{cosec} 30^\circ}{\cot 45^\circ}$

(b) Simplify the expression;

(i) $\frac{1 - 2 \sin^2 \theta}{\sin 2\theta}$

(ii) $\cos 58^\circ \cos 32^\circ - \sin 58^\circ \sin 32^\circ$

(c) In a triangle ABC, $a = 3$ cm, $b = 9$ cm, $c = 7$ cm. Find the value of A° expressed to whole number.

9. (a) Sketch the graph of $f(x) = -\left(\frac{2}{3}\right)^x$ and state the domain and range.
- (b) Solve for the value of x given that $\log_2 x^2 = (\log_2 x)^2$
- (c) A certain strain of bacteria that is growing on a kitchen counter doubles every five minutes. If initially the kitchen had one bacterium, how many bacteria could be present at the end of 96 minutes?
10. (a) Albert, Issa and Musa, are the students in form six class. Albert has 8 counter books, six textbooks and 2 calculators. Issa has 7 counter books, 9 textbooks and 1 calculator. Musa has 10 counter books, 5 textbooks and 3 calculators. Calculate the determinant of the matrix formed.
- (b) A calculator company produces scientific and graphic calculators. Long term prediction indicates an expected demand of at least 100 scientific calculators and 80 graphic calculator each day. Because of limitations of production capacity, no more than 200 scientific and 170 graphic calculator can be made daily. To satisfy a shipping contract, a total of at least 200 calculators must be shipped each day. If each scientific calculator sold results in 2000/= loss and each graphic calculator produces 5000/= profit. How many of each type should be made daily to maximize net profit. What is the maximum profit per day?