THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

141 **BASIC APPLIED MATHEMATICS**

(For Both School and Private Candidates)

Time: 3 Hours **Wednesday, 08th May 2019 a.m.**

Instructions

1. This paper consists of **ten (10)** questions.
2. Answer **all** questions.
3. Each question carries **ten (10)** marks.
4. All necessary workings and answers for each question must be shown clearly.
5. Mathematical tables and non-programmable calculators may be used.
6. Cellular phones and any unauthorized materials are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet(s).





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1. Use a non-programmable calculator to:

(a) Compute the value of $\dfrac{\sin^{-1}(2/3)}{7.4(\ln\sqrt[3]{87})\div 2817\log 6289}$ correct to 4 decimal places.

(b) Evaluate $\int_0^1 (3x-2)^5\,dx$.

(c) Solve the equation $x^2+6x-8=0$ correct to 3 decimal places.

(d) Find $2h(4)+t(4.5)$ correct to 4 decimal places, given that $h(x)=\dfrac{\sqrt{x+4}+(3+e^x)}{x+\sqrt[3]{x}}$

and $t(x)=\sqrt{\dfrac{(x-3)^{1/3}+(x+1)^6}{1+x}}$.

2. (a) The function is defined by $f(x)=\begin{cases} x^2+1 & \text{for} \quad x>1 \\ |x| & \text{for} \quad -2<x\le 1 \\ x+2 & \text{for} \quad x\le -2 \end{cases}$

(i) Sketch the graph of $f(x)$.

(ii) Determine the domain and range $f(x)$.

(iii) Find the value of $f(-3)$, $f(0.5)$ and $f(2)$.

(b) If $f(x)=x+\dfrac{1}{x}$, show that $[f(x)]^3=f(x^3)+3f(x)$.

3. (a) The difference of two numbers is 1 and the difference of their squares is 7. Find the two numbers.

(b) If the first term of a GP exceeds the second term by 4 and the sum of the second and third terms is $2\dfrac{2}{3}$, find the first three terms of the GP.

4. (a) Differentiate with respect to x the function $f(x)=e^{x^2+3x+2}$.

(b) Use implicit differentiation to find the derivative of $x^2+y^2-6xy+3x-2y+5=0$

(c) Find the stationary points of the function $f(x)=2x^3-3x^2-36x+14$ and determine the nature of each point.

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5. (a) Use substitution method to find the integral of each of the following functions:

(i) $\int x\sqrt{x^2+1}\,dx$

(ii) $\int \tan x\,dx$

(b) Find the area bounded by the curve $y = x^2 - 4x + 3$ and x - axis.

6. The scores of 22 students in one of the Basic Applied Mathematics test are 49, 64, 38, 46, 60, 68, 46, 42, 62, 38, 68, 57, 63, 76, 51, 55, 66, 63, 58, 47, 59 and 54.

(a) Summarize the above data in a frequency distribution table using class interval of 5 and lowest limit of 35.

(b) By using assumed mean A = 57, find the mean score (give your answers to five significant figures).

(c) Find the interquartile range in one decimal place.

7. (a) Show that ${}^nC_r = {}^nC_{n-r}$.

(b) The events A and B are such that $P(A) = 0.3$, $P(B) = 0.4$ and $P(A \cap B) = 0.1$. Use the appropriate formula to find $P(A' \cap B')$.

(c) A bag contains 8 marbles of which 3 are red and 5 are blue. One marble is drawn at random; its colour is noted and replaced in the bag. A marble is again drawn from the bag and its colour noted. Find the probability that the marble drawn will be red and blue in any order.

8. (a) Given a triangle XYZ, $\overline{XY} = 3.5$, $\overline{YZ} = 4.5$ and $\overline{ZX} = 6.5$. Calculate the size of angle Y.

(b) Solve the equation $1 + \cos\theta = 2\sin^2\theta$ for values of θ in the range 0 to 2π.

9. (a) Given that $A = \begin{pmatrix} 1 & 1 & 1 \\ 1 & -1 & 2 \\ 2 & 1 & -1 \end{pmatrix}$. Find:

(i) $|A|$.

(ii) A^{-1}.

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(b) Using the result obtained in (a) (ii) solve $\begin{cases} x+y+z=7 \\ x-y+2z=9 \\ 2x+y-z=1 \end{cases}$ simultaneously.

10. In a workshop, each carpenter makes chairs and tables. Carpenter I is limited to 10 days a month, whereas carpenter II is limited to 15 days a month. The following table shows the duration of time it takes to manufacture a chair and a table and the profit on each item.

	Chair	Table
Carpenter I	2	1
Carpenter II	1	3
Profit(USD)	30	45

(a) Taking x and y to be the number of chairs and tables each should make respectively, write down the four inequalities involving x and y which satisfy the given problem.

(b) Find the number of chairs and tables each carpenter should make in a month so as to maximize the income.

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