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).

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

    (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.

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}.

(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.