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

142/1 **ADVANCED MATHEMATICS 1**

(For Both School and Private Candidates)

Time: 3 Hours **Tuesday, 08th May 2018 a.m.**

Instructions

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

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1. (a) By using a non-programmable calculator , evaluate the following expressions correct to four decimal places:

(i) $\left(\sqrt{\frac{(8.621)(27.34)}{52.18+0.0724}}\right)^{\frac{3}{5}}$ and (ii) $\sum_{x=0}^{2} xe^{x}\log(x+1)^{\frac{1}{3}}$.

(b) Given that $a=14.2,\ b=12.6,\ c=8.4,\ T=(s(s-a)(s-b)(s-c))^{\frac{1}{2}}$ and $2s=a+b+c$. Use a non-programmable calculator to find the value of T correctly to four decimal places.

2. (a) Differentiate $\cosh^6 x$ with respect to x.

(b) Solve for x in the equation $3\cosh x+\sinh x=\frac{9}{2}$.

(c) Prove whether or not $\sinh^{-1} x=\ln\left(x+\sqrt{x^{2.}+1}\right)$ for values of x.

3. Mama Lishe has 140, 80 and 130 units of ingredients A, B and C respectively. A piece of bread requires 1, 1 and 2 units of A, B, C respectively. A pancake requires 5, 2 and 1 units of A, B and C respectively.

(a) Taking x and y to be the number of pieces of bread and pancakes respectively, write down three inequalities which satisfy these conditions.

(b) Draw a graph which shows a region representing possible values of x and y.

(c) If the price for a piece of bread is 300/= and a pancake is 500/=, how many of each snacks should she bake in order to maximize her gross income?

(d) What would be her gross income?

4. The following frequency distribution table represents a certain class of 100 students:

Class	1 - 10	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90	91 - 100
Frequency	t - 2	1	20	$t+2$	t	$t+3$	23	11	$t+4$	13

(a) Determine the value of t.

(b) Find the following measures of central tendency and dispersion correct to two decimal places:

(i) mean,

(ii) standard deviation,

(iii) mean deviation,

(iv) median.

5. (a) Simplify $A-(A-B)$ using properties of sets.

(b) Shade set $A'\cap(B-C)$.

(c) In a survey of 500 movie viewers, 250 were listed as liking 'zecomedy', 200 as liking 'zembwela' and 85 were listed as liking both 'zecomedy' as well as 'zembwela'. Using the appropriate formula, find how many people were liking neither zecomedy' nor 'zembwela'.

6. (a) (i) Given the functions $f(t)=e^t$ and $g(t)=\ln t$. Show that $f\circ g(t)=gof(t)$.

(ii) If $f(t)=at$, $g(t)=bt^2+3$, $(fog)(2)=35$ and $(fog)(3)=75$, find the values of a and b.

(b) Given that, $f(x)=\dfrac{x^3}{1-x^2}$

(i) Find horizontal and vertical asymptotes of $f(x)$.

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

(iii) State the domain and range of the function $f(x)$.

7. (a) Approximate the value of $\int_3^7 \frac{1}{x-2}dx$ correct to four decimal places by using;

(i) The trapezoidal rule with five ordinates and

(ii) The Simpson's rule with five ordinates.

(b) Evaluate the exact value of the integral $\int_3^7 \frac{1}{x-2}dx$ and compare your answer with those found in part (a).

8. (a) If the circles $x^2+y^2-2y-8=0$ and $x^2+y^2-24x+hy=0$ cut orthogonally, determine the value of h.

(b) Find the equation of the normal line passing through point K(7, 4) to the circle whose equation is $x^2+y^2-4x-6y+9=0$.

(c) Calculate the area of the triangle whose vertices are the points L(3, 5), M(4, 2) and N(6,3).

9. (a) Find $\int \frac{x-2}{(x^2+2)(x+1)}dx$.

(b) Evaluate $\int_0^{\frac{5}{3}\pi} \frac{\tan x+\sin x}{\cos x}dx$.

(c) (i) If A and B are any two points on the graph of $y=f(x)$, derive the arc length formula for the curve AB from $x=a$ to $x=b$.

(ii) Find the length of a curve $y=\frac{3}{4}x$ from $x=0$ to $x=4$.

10. (a) Given the curve $x\sin y+y\cos x=2$. Find $\frac{dy}{dx}$ when $x=\frac{\pi}{2}$ and $y=\pi$.

(b) Use the second derivative test to investigate the stationary values of the function $f(x)=2x^2-8x+5$.

(c) Differentiate $f(x)=\frac{1}{2}\cos 3x$ from first principles.