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

042 ADDITIONAL MATHEMATICS

(For Both School and Private Candidates)

Time: 3 Hours **Thursday, 12th November 2015 p.m.**

Instructions

1. This paper consists of sections A and B.
2. Answer **all** questions in section A and **four (4)** questions from section B. Each question in section A carries **six (6)** marks while each question in section B carries **ten (10)** marks.
3. **All** necessary working and answers for each question must be shown clearly.
4. Mathematical tables may be used.
5. Calculators and cellular phones are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

SECTION A (60 Marks)

Answer **all** questions in this section.

1. (a) Find the next three terms in each of the following sequences;

   (i) $\frac{3}{5}, \frac{10}{8}, \frac{16}{18}, \frac{16}{18}, \frac{36}{34}$, _____, _____, _____.

   (ii) 1, 4, 9, 16, 25, _____, _____, _____.

   (b) By rounding each term to 2 significant figures, find the approximate value of M in $M = \frac{6.7782+2.974}{7.332-2.422}$.

2. If the sets, $\mu = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$ and $C = \{3, 4, 5, 6\}$, find;

   (a) A',

   (b) $(A \cap C)'$,

   (c) $(B\text{-}C)'$.

3. (a) If α and β are the roots of $x^2 - 2x - 4 = 0$, find the values of $\alpha^2 + \beta^2$.

   (b) By using the remainder theorem, find the remainder when the polynomial, $P(x) = x^3 + 2x^2 - 4x + 1$ is divided by $D(x) = x - 3$.

4. (a) Make t the subject of the formula in the equation $s = ut - \frac{1}{2} gt^2$.

   (b) Solve the following pair of simultaneous equations;

   $$\begin{cases} xy=10 \\ 3x+2y=16 \end{cases}$$

5. (a) Calculate the size of an exterior angle of a polygon with 12 sides.

   (b) How many sides a polygon has, if its sum of interior angles is 1520°?

6. T varies jointly with the square root of x and inversely as the square of y. When x is 9, y is 8 and T is 6. Find,

   (a) the equation of the variation by writing T as a function of x and y,

   (b) T when $x = \frac{1}{4}$ and $y = \frac{1}{6}$.

7. Differentiate $y = 2\pi x - 3x^2$ from the first principle.

8. (a) Eliminate θ from the equations $x = a\tan\theta$ and $y = b\cos\theta$.

(b) (i) Define the term "Supplementary angle".

(ii) If $2x - 40°$ and $80° - 2x$ are supplementary angles, find the value of x.

9. (a) Define the term "Locus" as it is used in mathematics.

(b) Find the equation of the locus of point P(x,y) which is equidistant from point A (0,1) and the line $x - y = 0$.

10. (a) Define the following terms;

(i) Front elevation,

(ii) Plan view of an object.

(b) Draw the plan, front and side elevations of a cylinder which has a diameter of 1.5cm and height of 2cm.

SECTION B (40 Marks)

Answer **four (4)** questions from this section.

11. (a) Find the coordinates of a point that divides the line segment joined by points A (5,8) and B (-8,5) in the ratio 3:2.

(b) Find the tangents of the angle between the lines $4x + 3y - 12 = 9$ and $y - 3x = 0$.

(c) Given the equation of the circle $4x^2 + 4y^2 + 20x - 16y + 37 = 0$, find its centre and radius.

12. (a) The amount of annual rainfall in centimeters for a period of 15 days was recorded as follows:

25, 38, 27, 39, 42, 34, 27, 26, 24, 33, 32, 35, 44, 29, 27. Find the median and range.

(b) The following table shows the ages of 50 adults which were recorded from a certain village.

Age	52-48	47-43	42-38	37-33	32-28	27-23	22-18
Number of people	4	6	7	11	9	8	5

Calculate the mean and standard deviation.

13. (a) Write the truth value of the following mathematical statement;

"If 2 is a prime number, then 2 is not an even number".

(b) Construct the truth table for the proposition $p \wedge (q \vee r)$.

(c) Test the validity of the following argument:
Tanzania is making a new constitution. Either Tanzania is editing her constitution or Tanzania is making a new constitution. If Tanzania is making a new constitution then Tanzania has a constitution. Therefore, Tanzania has a constitution and Tanzania is making a new constitution.

14. (a) Three unbiased coins are tossed once.
(i) Draw the probability tree diagram to show the results of the experiment.
(ii) Find the probability of getting at most two heads.
(b) Find the number of ways of selecting 9 balls from 6 red balls, 5 white balls and 5 blue balls if each selection consists of 3 balls of each colour.

15. (a) Given that $\underline{a} = \underline{i} + \underline{j} + \underline{k}$, $\underline{b} = \underline{i} - \underline{j} - \underline{k}$ and $\underline{c} = \underline{i} - 2\underline{j} + 3\underline{k}$. Find $\underline{a} \times (\underline{b} \times \underline{c})$.
(b) Solve the following system of simultaneous equations by substitution method;

$3y + 2x = z + 1$

$3x + 2z = 8 - 5y$

$3z - 1 = x - 2y$

(c) A transformation is defined by the matrix equation $(x', y') = \begin{pmatrix} 2 & 0 \\ 0 & -2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$. Find the image of point R (1, 1) under this transformation.

16. (a) If $\frac{dy}{dx} = 3x^3 - 4x^2 + 5x + 1 + \frac{1}{x^2}$, find y in terms of x.
(b) Evaluate the definite integral $\int_0^{\frac{\pi}{2}} (\cos x + 2\cos 2x)\, dx$.
(c) Use product rule to find the derivative of $(2 - x^2)(3x + x^2)$.