THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

740 **MATHEMATICS**

Time: 3 Hour. **Year: 2021**

Instructions

1. This paper has Section A, B and C with a total of Sixteen (16) questions.
2. Answer all questions from Section A and two (2) questions from Section B and C each.
3. Section A carries forty (40) marks and Section B and C carries thirty (30) marks each.
4. Mobile phones are not allowed inside the examination room.
5. Write your Examination Number on every page of your answer booklet.

SECTION A (40 Marks)

Answer all questions in this section.

1. Find the turning point on the curve $y = x^2 - 2x$

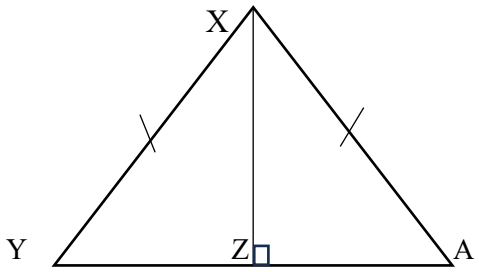
2. Find the focus and directrix of the parabola; $y^2 - 4y - 12 + 16 = 0$

3. Find the number of arrangements that can be formed using the letters of the words

   (a) EQUATION
   (b) TUMBAKU.

4. Suppose the items processed on a certain machine are found to be 1% defective. Determine the probability of obtaining 4 defectives in a random sample batch of 80 such items

5. You are given the following figure. Prove that ΔXYZ is congruent to ΔXAZ.



6. outline any four qualities of a well stated specific objective in Mathematics lesson plan.

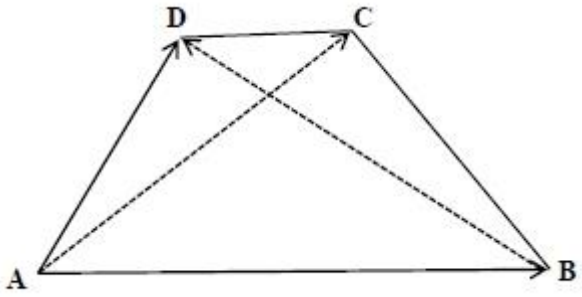
7. Evaluate $\int \sinh^3\theta \, d\theta$

8. Find the equation of an ellipse with foci $(\pm 1, 0)$ *with directrices of* $x = \pm 4$

9. define the following terms as used in Mathematics lesson:
   (a) Mathematics logbook.
   (b) Lesson plan.
   (c) Scheme of work.

10. Prove that the vector area of a quadrilateral *ABCD* with diagonals AC and BD is given by ½ |AC x BD|

    From the figure below:



SECTION B (30 Marks)

Answer any two questions from this section

11. (a) The roots of a polynomial equation are $2x^3 - 5x^2 + 7x - 8 = 0$ are α, β and γ. Find the equation whose roots are:

    (i) $\frac{1}{\alpha\beta}, \frac{1}{\alpha\gamma}$ *and* $\frac{1}{\beta\gamma}$

    (ii) α – 1, β – 1 and γ – 1

    (b) The roots of the equation $x^2 + 2px + q = 0$ differs by 2, show that $p^2 = 1 + q$

12. There two types of fertilizers F1 and F2. F1 consists of 10% nitrogen and 6% phosphoric acid and F2 consists of 5% nitrogen and 10% phosphoric acid. After testing the soil nutrient composition, a farmer found that she needs at least 14kg of nitrogen and 14kg of phosphoric acid for her crop. If F1 costs 600 Tsh. Per kilogram (kg) and F2 costs 500 Tsh. per kilogram.

    (a) determine how much of each type of fertilizer should be used so that the nutrient requirements are met at minimum cost;

    (b) state the minimum cost.

13. (a) Use standard results of $\sum r^2 = \frac{n}{6}(n+1)(2n+1)$ *and* $\sum r = \frac{n}{2}(n+1)$ to find the sum of the first 50 terms of the series $2 + 6 + ... + (n^2 - n)$

    (b) Prove that $2b^2 = 9ac$ where a,b and c are real numbers, given that one root of the quadratic equation $ax^2 + bx + c = 0$ is twice the other.

    (c) Find an equation with integral coefficients whose roots are the cubes of the roots of the equation $2x^2 + 5x - 6 = 0$

SECTION C (30 Marks)

Answer any two questions from this section.

14. explain the following components of a lesson plan as used in the teaching and learning of Mathematics:

    (a) Preliminary information

    (b) Objectives

    (c) Lesson development

    (d) Students' and teachers' evaluation.

15. Explain how the understanding and application of Maslow's hierarch of needs can promote better learning of Mathematics in schools.

16. Describe five methods of teaching Mathematics.