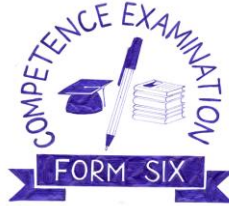


THE PRESIDENT’S OFFICE
REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT
FORM SIX COMPETENCE EXAMINATIONS (FOSCE) - 2025



CODE: 141

BASIC APPLIED MATHEMATICS

TIME: 3 HOURS

20TH FEBRUARY 2025, AM

INSTRUCTIONS:

1. This paper consists of **ten (10)** questions and each question carries **10 marks**.
2. Answer **ALL** questions
3. All working must be shown clearly on how you arrived at the answer.
4. NECTA’s mathematical tables and non-programmable calculators may be used
5. Cellular phones are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklets.

1. Use a non-programmable scientific calculator to compute;

a) $\sum_{x=2}^6 \ln\left(\frac{3^x}{\log x + \sqrt[3]{x}}\right)$, to five significant figure

- b) Evaluate

$$\int_3^4 \frac{1}{7-15x} dx$$

- c) Mean and standard deviation, and the sum of squares of the data of the following observation (correct to four decimal places)

Value	112.25	122.25	132.25	142.25	152.25	162.25	172.25
Frequency	13	25	22	37	17	14	3

- d) Given

$$A = \begin{pmatrix} 2 & 3 & 5 \\ 4 & 1 & 6 \\ 1 & 4 & 0 \end{pmatrix}. \text{ Find } (A^2)^T.$$

2. a) Consider the table as here under of cost mailing parcels

Weight in grams(x)	$0 < x \leq 50$	$50 < x \leq 100$	$100 < x \leq 150$	$150 < x \leq 200$	$200 < x \leq 250$
Cost in Tsh f(x)	500	700	900	1100	1300

Using the above useful information, draw the required graph of the function and state domain and range

- b) Sketch the graph and state domain and range of $y = \frac{1}{x-3} + 2$

3. a). Given the series $-1 + 1 + 3 + \dots$

(i). Express it in sigma notation.

(ii). Find S_{100} .

- b) The fifth term of an arithmetic progression is 6 times the second term and the sum of the second and third is eleven. Find.
- The common difference
 - The fifth term
 - The sum of the first ten terms
4. a) Apply first principle of differentiation to find the derivative of
- $f(x) = \sqrt{x}$
 - $y = 5x^2 + 2$
- b) Use second derivative test to classify the stationary points of the curve
- $$f(x) = 2x^3 + 3x^2 - 12x - 5$$
- c) A particle moving in a straight line has its displacement governed by the equation
- $$S(t) = -2t^2 + 10t - 1$$
- where S is in metres and t in seconds. Find velocity and acceleration of a particle at a time t.
5. a) Find the following
- $\int x\sqrt{(3x^2 - 1)}dx$
 - $\int_{\frac{\pi}{6}}^{\frac{\pi}{4}} \frac{\sec^2 \theta}{\tan \theta} d\theta$
- b) Find the area between the curve $y = x(4 - x)$ and the x-axis from $x = 0$ to $x = 5$
6. The following table shows the distribution of marks on a pre mock examination in

Basic Applied Mathematics

Marks	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69
Frequency f	2	5	13	16	9

- Draw the cumulative frequency curve (ogive) and use it to estimate the median.
- By coding method calculate mean and standard deviation
(Use Assumed mean= 44.5)

- c) Find P_{10} (10 percentile) of the distribution
7. a) One card is selected from a pack 52 playing card, what is the probability that the card will be either diamond or a black ace
- b) If A and B are dependent events such that $P(B) = \frac{2}{3}$, $P(A) = \frac{3}{5}$ and $P(A \cap B) = \frac{1}{4}$ find
- $P(A/B)$
 - $P(A \cup B)$
- c) If $(n + 2)! = 2550(n!)$, find n.
8. a) If $\cos(x + \beta) = 2\sin(x - \beta)$, show that $\tan x = \frac{1 + 2 \tan \beta}{2 + \tan \beta}$
- b) Eliminate θ from the equations $x = a \sin \theta$, $y = b \cos \theta$
- c) Evaluate the value of $\tan 15$ without using calculator.
9. (a) Solve for x if $\log_2(x + 7) - \log_2 x = 3$
- b) The growth of a certain bacteria is given by equation $P = Poe^{0.195t}$, if initially were 500 bacteria present and 't' is given in hours, find:
- How many bacteria are after two days?
 - How long will it take to have 10,000 bacteria
10. (a) If matrix $A = \begin{pmatrix} -1 & 3 & -2 \\ 4 & -1 & -3 \\ 2 & 2 & -5 \end{pmatrix}$, show whether its singular or not.
- b) A special diet for laboratory animals is to contain at most 11 units of vitamins and 56 units of minerals. There are two mixtures of the diet available, mixture A and mixture B. One gram of mixture B contains 1 unit of vitamins and 7 units of minerals, Mixture A contains 1gm of vitamin and 4gm of minerals. Mixture A costs TZS 40 per gram, while mixture B costs 60 per gram. Find the amount of each mixture to be used to satisfy the requirements of the diet at a minimum cost.