



141

TANZANIA HEADS OF ISLAMIC SCHOOLS COUNCIL
FORM SIX INTER ISLAMIC MOCK EXAMINATION

BASIC APPLIED MATHEMATICS

(For both School and Private candidates)

Time: 3 Hours

Tuesday 5th March, 2024 a.m.

Instructions

1. This paper consists of ten (10) compulsory questions.
2. Answer all questions.
3. Each question carries ten (10) marks.
4. All work done in answering each question must be shown clearly.
5. Mathematics 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 scientific calculator to:

(a) Find the value of $\frac{547}{250} \sum_{i=0}^3 (i(i+3)(i+4))^{\frac{1}{2}}$

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

(c) Find mean, standard deviation and the sum of squares of the data of the following observation (correct to four decimal places).

Value	62	63	64	65	66	67	68	69	70
Frequency	13	25	52	84	120	135	101	61	40

2. (a) If $f(x) = 3+4x-x^2$, determine the following:

- (i) The turning point
- (ii) The axis of symmetry
- (iii) The maximum or minimum value of the function.

(b) Sketch the graph of $f(x) = \frac{x-1}{x-4}$ and use it to state domain and range.

3. (a) Find the value of x satisfying the equation $4^x - 6(2^x) - 16 = 0$.

- (b) (i) Convert 2.666666 ... into series and form a fraction.
- (ii) The sum of a certain number of terms of a G.P having first term 1 and common ratio 2 is 255. How many terms are there?

(c) Use substitution method to solve

$$\begin{cases} 3x - y = 9 \\ x^2 - xy + 2 = 0 \end{cases}$$

4. (a) Apply first principle of differentiation to find the derivative of $f(x) = \sqrt{2x+1}$.

- (b) (i) Find the slope of the tangent to the curve $8x^3 + xy^3 - 5y^2 = 0$ at (1,-1).
- (ii) Use second derivative test to classify the stationary points of the curve.
 $f(x) = 2x^3 + 3x^2 - 12x - 5$.

(c) The effectiveness of a pain killing drug incurs after entering the blood stream is given by $E(t) = \frac{1}{27}(9t + 3t^2 - t^3)$. Find the rate of change of t after 3 hours.

5. (a) Evaluate $\int_1^2 \frac{x^2 + 1}{x^3 + 3x} dx$.

(b) Evaluate $\int \frac{1}{2x-1} dx$.

(c) Assume that the marginal cost in Tanzanian shillings is given by

$Mc(x) = \frac{3}{7}e^{-2x} + 6x^2 + 11$. Where x is the quantity produced. Find the total cost of production when $x = 3$, if the fixed cost is Tsh 10,000.

6. Carefully study the frequency distribution below:

Interval	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40
Frequency	8	13	14	9	16	18	12	10

Calculate:

(a) The variance by coding method using 28 as an assumed mean.

(b) The range of the data.

(c) The upper quartile.

(d) The 80th percentile

7. (a) Two dice are rolled. Find the probability of getting the sum equal to 10.

(b) A and B are mutually exclusive events with $P(A) = \frac{1}{2}$ and $P(B) = \frac{1}{4}$.

Find $P(A \cap B')$

(c) Let A and B be two events such that $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{4}$ and $P(A \cap B) = \frac{1}{8}$

(i) $P(A/B)$

(ii) $P(A/B^c)$

8. (a) If $\sin A = \frac{4}{5}$, $\cos B = \frac{12}{13}$. Find the value of $\cos(A + B)$

(b) Eliminate θ from the following pair of equations

$$\begin{cases} X = 1 + \cos 2\theta \\ Y = 4 \sin \theta \end{cases}$$

(c) Prove the identity $\frac{2 \tan \theta}{1 + \tan^2 \theta} = \sin 2\theta$

9. (a) If $a = \log_b^c$, $b = \log_c^a$, $c = \log_a^b$ prove that $abc=1$.
- (b) Sketch the graph of $f(x)=2^x$ and $g(x)=\log_2^x$ in the same axes hence comment on the graph you sketch.
- (c) How many years will it take for Mary to have the amount of money accumulated twice the principal in a bank that provides an interest of 10% compounded annually?

10. Ideas company makes two types of furniture chairs and tables. The contribution of each product is Tsh 1500/= per chair and 2500 per table. Both products are processed by machine m_1 , m_2 , m_3 . The time required in hours per week in each machine is as follows:

Machine	Chair	Table	Available
M_1	3	3	36
M_2	5	2	50
M_3	2	6	60

- (i) How should the company schedule its production in order to maximize production?
- (ii) Find the maximum contribution.

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