



TANZANIA HEADS OF ISLAMIC SCHOOL COUNCIL
FORM SIX INTER ISLAMIC MOCK EXAMINATION
ADVANCED MATHEMATICS 1

(For Both School and Private Candidates)

142/1

TIME: 3 Hours

Wednesday, 4th March 2026 a.m.

Instructions

1. This paper consists of **ten (10)** questions.
2. Answer **all** questions.
3. All work done in answering each question must be shown clearly.
4. Mathematical tables and Non-programmable calculators may be used.
5. Communication devices and any unauthorized materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

1. (a) Use non-programmable scientific calculator to evaluate each of the following:

(i) $\left(\frac{\tan^{-1} 0.345 + \ln \sqrt[3]{19.78}}{\cos 78^\circ 39' 40'' + \log \pi} \right)^2$

(ii) $\left(\sqrt{\frac{\ln 5 + e^2 \times (8.23 \times 5!) + \log 5}{\sqrt{7}}} \right)^{2/5}$

(b) Given that $b = \frac{t-10}{s}$, $S = 7C_3 + \sum_{i=2}^4 (1+i)^2$

$t = \text{derivative of } (x^2 + 3)^5$, at $x = 1$ and $R = \text{Cosh}\left(\frac{t-22(b+S)}{10}\right)$. Use a non-programmable calculator to find the value of R correct to four decimal places.

2. (a) Prove that $\frac{1+\tanh X}{1-\tanh X} = e^{2X}$

(b) The curve C is defined parametrically by $x = t + \ln(\text{Cosht})$ and $y = \text{Sinht}$.

(i) Show that $\frac{dx}{dt} = e^{-t} \text{Cosh}^2 t$

(ii) Hence show that $\frac{d^2y}{dx^2} = e^{-2t}(2\text{Sinht} - \text{Cosht})$

(iii) Deduce that C has an inflection point where $t = \frac{1}{2} \ln 3$.

3. Hamisi the civil engineer has two warehouses W_1 and W_2 containing 900 and 600 tones of bricks respectively. He is constructing houses at sites P, Q and R. He needs 500 tones at P, 600 tones at Q and 400 tones at R. The transportation cost per ton of brickss is as follows:

From \ To	P	Q	R
W_1	600/=	500/=	400/=
W_2	400/=	400/=	600/=

(a) How should Hamisi do to minimize the transportation cost?

(b) What is the minimum cost?

4. (a) You are provided with the data set X with the mean $\mu = 50$ and varies $\delta^2 = 16$. A dataset Y is created by applying the transformation $Y_i = \frac{X_i - 50}{4}$

(i) Find the new mean and standard deviation?

(ii) What is the value of the 3rd quartile of Y if the original Q_3 of X was 58?

(b) The frequency distribution for the values of resistance in ohm of 48 resistors is as shown below.

Resistance	20.5-20.9	21.0-21.4	21.5-21.9	22.0-22.4	22.5-22.9	23.0-23.4
Number of resistors	3	10	11	13	9	2

Calculate the mean and standard deviation. Correct to 3 significant figures.

5. (a) Simplify giving reasons:

(i) $(P-Q) - (PUQ')$

(ii) $[An(AuB)']'$

- (b) In a class of 150 students the following results were obtained in a certain examination: 45 students failed in Maths, 50 students failed in Physics, 48 students failed in Chemistry, 30 students failed in both Maths and Physics, 32 students Physics and Chemistry, 35 students failed in both Maths and Chemistry, 25 students failed in all three subjects.

Draw the Venn diagram corresponding to this data and use it to find the number of students who:

(i) Failed at least one subject

(ii) Passed the examination.

6. (a) A temperature in Celsius is first converted to Fahrenheit using $f(x) = \frac{9}{5}x + 32$ then converted from Fahrenheit to Kelvin using $g(x) = \frac{5}{9}(x - 32) + 273$.

(i) Write the composite function $g \circ f(x)$

(ii) Find the Kelvin temperature when Celsius temperature is 25°C .

- (b) The function defined for a given continuous domains as

$$f: x \rightarrow \frac{1}{x} \text{ for } \{x \in \mathbb{R}: 0 < x \leq 5\}$$

(i) Sketch the graph of the function

(ii) State the range of the function

(iii) State the type of mapping.

7. (a) Let $u = \frac{5xy^2}{z^3}$, ΔX , Δy , Δz denote the errors in X, Y and Z respectively. If $x = y = z = 1$ and $\Delta x = \Delta y = \Delta z = 0.001$. Find the maximum error in μ .

- (b) Given that $f(x) = x^4 - 4x + 1$

(i) Show that $f(x) = 0$ has a root between 0 and 1.

(ii) Use the Newton – Raphson method to approximate the root between 0 and 1 (Use $X_0 = 0.2$).

- (c) Evaluate $\int_0^1 e^{x^2} dx$ correct to 4 decimal places by trapezium rule with 5 ordinates.

8. (a) A line passing through the point (1,2) and (4,6). Find the perpendicular distance from the point (2, 3) to this line.
- (b) Find the ratio in which the line from the point A (2, 3) to B (6, 0) is divided internally by the line $y = x - 2$.
- (c) Find the equation of the circle which passes through the points A (4,-3) and touches the line $x + 2y - 7 = 0$ at B (3, 2).
9. (a) Find $\int \frac{1}{x^3 - 3x^2 + 2x} dx$
- (b) Evaluate $\int_0^{\frac{\pi}{4}} \frac{1}{1 + \cos^2 x} dx$
- (c) Sketch the graph $f(x) = (x - 1)^2$ and $g(x) = x + 1$ in the same axis and hence determine the area enclosed between the curve and the straight line.
10. (a) Given that $x = t^2 + 2t$, and $y = t^3 - t$
- (i) Find $\frac{dy}{dx}$
- (ii) Find the equation of the tangent at $t = 1$.
- (b) Use first principle to find $\frac{dy}{dx}$ if $y = \frac{1}{2} \sin 2x$.
- (c) A rectangular field is to be fenced in three sides, the 4th side being a wall. If 100m of fencing materials is available, find the maximum area of the field.

Wabillah Tawfiq