P425/1
PURE MAT.
Paper 1
July/August 2024
3 hours

WESTERN JOINT MOCK EXAMINATIONS
Uganda Advanced Certificate of Education

PURE MATHEMATICS

Paper 1

3 hours

INSTRUCTIONS TO CANDIDATES:

- *Answer* **all** *the eight questions in Section* **A**, *and any* **five** *from section* **B**.
- *Any additional question(s) attempted will* **not** *be marked.*
- ***All*** *your working* **must** *be clearly shown.*
- *Begin each question on a fresh sheet of paper.*
- *Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.*

SECTION A (40 MARKS)

*Answer **all** the questions in this section*

1. If $\tan x = \frac{7}{24}$ and $\cos y = \frac{-4}{5}$ where x is reflex and y is obtuse, find without using tables or calculators the value of $\sin(x + y)$. *(05 marks)*

2. Calculate the perpendicular distance between the parallel lines $3x + 4y + 10 = 0$ and $3x + 4y - 15 = 0$. *(05 marks)*

3. The sum of n terms of a particular series is given by $S_n = 17n - 3n^2$.
   (a) Find an expression for the n^{th} term of the series.
   (b) Show that the series is an Arithmetic progression. *(05 marks)*

4. Use the calculus of small changes to find $\sin 149.82°$ correct to five significant figures. *(05 marks)*

5. Solve the equation $(\log_3 x^2)(\log_{9x} 3) = 1$ *(05 marks)*

6. Find the coordinates of the point where the line $\frac{x-3}{5} = \frac{3-y}{-2} = \frac{z-4}{3}$ meets the plane $2x - 3y + 7z - 10 = 0$ *(05 marks)*

7. Evaluate $\int_0^4 2x\sqrt{4-x}\,dx$ *(05 marks)*

8. At any point on a Cartesian curve $\frac{dy}{dx} = (3x - 2)(x + 2)$. Given that it passes through the point (1, 1), find the equation of the curve. *(05 marks)*

SECTION B (40 MARKS)

*Answer **five** questions from this section.*

9. (a) Evaluate $\int_0^{½} \frac{x+2}{4x^2+1}\,dx$ *(06 marks)*

   (b) Show that $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1-\cos^2 x} = \frac{1}{\sqrt{3}}$ *(06 marks)*

10. (a) A student deposits Shs 1,200,000 once into her Savings account on which an interest of 8% is compounded per annum. After how many years will her balance exceed Shs 2,000,000? *(05 marks)*

    (b) The polynomial $f(x) = x^4 + ax^3 + bx^2 + cx + 1$ is divisible by $(x + 1)^2$ and leaves a remainder of 12 when divided by $(x - 1)$. Find the values of a, b and c. *(07 marks)*

11. (a) **A** and **B** are the points (3, 1, 1) and (5, 2, 3) respectively, and **C** is a point on the line $\underline{r} = \begin{pmatrix} 2 \\ 4 \\ -2 \end{pmatrix} + \lambda \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix}$.

If angle BAC = 90°, find the coordinates of **C**. *(06 marks)*

(b) The vector $\begin{pmatrix} 4 \\ 1 \\ 2 \end{pmatrix}$ is perpendicular to the plane containing the line $\frac{x-3}{-2} = \frac{y+1}{a} = \frac{z-2}{1}$, find the;

(i) value of a.

(ii) Cartesian equation of the plane. *(06 marks)*

12. (a) In a triangle ABC, $\overline{AB} = 10\text{cm}$, $\overline{BC} = 17\text{cm}$ and $\overline{AC} = 21\text{cm}$, calculate the angle BAC. *(05 marks)*

(b) Solve the equation $\sin 3x + \sin 7x = \sin 5x$ for $0° \leq x \leq 90°$ *(07 marks)*

13. (a) Solve the equation $2z - i\bar{z} = 5 - i$ where $z = x + iy$ *(05 marks)*

(b) Express the complex number $z = \frac{(3i+1)(i-2)^2}{i-3}$ in the form $a + bi$ where a and b are integers. Hence find

(i) the modulus of z

(ii) the principal argument of z *(07 marks)*

14. (a) The radius of a sphere is decreasing at the rate of 3cms^{-1}. Obtain the rate of decrease of the surface area of the sphere when the radius is 18cm. (Use $\pi = 3.14$) *(05 marks)*

(b) Differentiate the following with respect to x.

(i) $\log_2 tan^3(4x + 5)$

(ii) $\frac{(3x^2+5)^4}{(2x-3)^3}$ *(07 marks)*

15. (a) Show that $3x^2 + 2y^2 + 6x - 8y = 7$ is an ellipse and hence determine its centre and eccentricity. *(06 marks)*

(b) P is a point on the ellipse whose parametric equation is given by $x = 3\cos\theta$ and $= 2\sin\theta$. The line joining the origin, O to P is produced to Q such that $\overline{OQ} = 2\,\overline{OP}$.
Determine the Cartesian equation of the locus of Q. *(06 marks)*

16. In an agricultural plantation, the properties of the total area that has been destroyed by a bacteria disease is **X**. The rate of destruction of the plantation is proportional to the product of the properties already destroyed and that not yet. It was initially noticed that half of the plantation had been destroyed by the disease and that at this rate another quarter of the plantation would be destroyed in the next 6 hours.

(a) Form a differential relating x and time, t.

(b) Calculate the percentage of the population destroyed 12 hours after the disease was noticed. *(12 marks)*

END

P210/3
HISTORY
(European History 1789-1970)
Paper 3
July/August 2024
3 hours

WESTERN JOINT MOCK EXAMINATIONS
Uganda Advanced Certificate of Education

HISTORY
EUROPEAN HISTORY (1789-1970)

Paper 3

3 hours

INSTRUCTIONS TO CANDIDATES:

- *Answer **four** questions only.*
- *All questions carry equal marks*
- *Any additional question(s) answered will **not** be marked.*

1. Examine the cause of the financial difficulties of the French crown before the summon of the Estate General meeting in France by 1789. *(25 marks)*

2. How successful was Napoleon Bonaparte I in his domestic policy between 1799 and 1815? *(25 marks)*

3. Assess the impact of the Vienna congress of 1814-1815 on the people of France. *(25 marks)*

4. Why did the Kingdom of Netherlands experience instabilities by 1830? *(25 marks)*

5. To what extent was the Turkish administration responsible for the outbreak of 1875-1878 Balkan Crisis? *(25 marks)*

6. To what extent were the internal factors responsible for the delay of the Germany Nationalism before 1850? *(25 marks)*

7. "Kaisser William II was primarily responsible for the outbreak of world war I by 1914" Discuss. *(25 marks)*

8. Examine the weakness of the 1919 Versailles Peace settlement. *(25 marks)*

9. "Anglo-French policies were primarily responsible for the collapse of the League of Nations" Discuss. *(25 marks)*

10. To what extent was the North Atlantic Treaty organization (NATO) successful in maintaining peace in Europe between 1949 and 1970? *(25 marks)*

END

456/1
MATHEMATICS
Paper 1
July/August 2024
2¼ hours

WESTERN JOINT MOCK EXAMINATIONS
Uganda Certificate of Education

MATHEMATICS

Paper 1

2 Hours 15 Minutes

INSTRUCTIONS TO CANDIDATES:

- *This paper of* **two** *sections;* ***A*** *and* ***B****. It has* **six** *examination items.*
  Section A *has two compulsory items.*
  Section B *has two parts;* ***I*** *and* ***II****. Answer* **one** *item from each part.*
- *Answer* ***four*** *examination items in all.*
- *Any additional item(s) answered will not be scored.*
- *All answers* ***MUST*** *be written in the answer sheets provided.*
- *Graph paper is provided.*
- *Silent, non-programmable scientific calculators and mathematical tables with a list of formula may be used.*

SECTION A

*Answer **all** items in this section*

Item 1: **(20 Scores)**

Simon is the District Inspector of schools in Mitooma District own a farm that measures 308ft by 228ft. He plans to put fencing posts along its sides at equal distances apart. One day, Simon discovered that the casual labourers he hired had used one third of his farm for banana growing, one quarter for coffee growing. Two fifths of the remainder were used for mixed farming.

Mahyoro senior secondary school has a student population of 1200 students. On a particular day, Simon invited the entire school on his farm for a field study. 55% of the students who attended the study were boys. In his interview, Simon told students that the price of his farm was valued at forty five million shillings. It increased by 25% after the first year but in the second year, the value of the farm reduced by 10%.

Task:

(a) Help Simon know the greatest distance between the fencing posts.

(b) Help Simon to know the type of farming that takes the biggest percentage of his farm.

(c) Find;

(i) the number of girls that attended the field study on his farm.

(ii) the value of Simon's farm at the end of the second year.

Item 2: **(20 Scores)**

Mr. Kafeero wants to start a new business. He needs at least 5 buses and 10 lorries to use in transportation of goods. He does not want to have more than 30 vehicles altogether. A bus takes 3 units of garage space and a lorry takes up 1 unit of garage space. Mr. Kafeero has 54 units of garage space available. He is to spend 15 million as running costs a day for a bus and 8 million for a lorry.

Task:

(a) Write down the set of mathematical expressions representing restrictions on Mr. Kafeero.

(b) Show the feasible region of the relation on a Cartesian plane.

(c) Help Mr. Kafeero find the maximum daily cost and the corresponding number of buses and lorries.

SECTION B

*This section has **two** parts: I and II*

PART I

*Answer **one** item from this part.*

Item 3: **(20 Scores)**

In your class, there are 50 students. On a particular visiting day, your class was tasked to collect the empty bottles of mineral water dumped in the school compound. The number of empty bottles collected were as follows;

25	30	29	60	72	59	40	40	62	70
30	39	62	65	40	59	39	43	80	21
58	29	19	25	30	32	56	59	40	55
69	90	81	50	31	45	20	51	51	49
31	30	56	58	50	50	60	40	40	70

The class teacher grouped the students according to the brand of empty mineral water bottle collected; Rwenzori (R), Nivana (N) and Aquasipi (A). It was noted that

collected Rwenzori bottles, 26 collected Nivana bottles and 29 collected Aquasipi bottles. Nine students collected both Rwenzori and Aquasipi bottles, 13 collected Nivana and Aquasipi while 11 collected both Rwenzori and Nivana bottles. Each of the students collected at least one of the three brands of mineral water bottles.

Task:

(a)(i) Help the class teacher group the number of bottles collected beginning with the 15 – 24 group.

(ii) Find the mean and modal number of bottles collected.

(b)(i) Help the class teacher know the number of students who collected all the three brands of bottles.

(ii) If a student is selected at random, what is the probability that the student collected only two brands of bottles?

Item 4: **(20 Scores)**

A farm has three poultry units; **A, B** and **C**. Unit **A** produces 30 trays of eggs and 20 broilers every month. Unit **B** produces 40 trays of eggs and 15 broilers and unit **C** produces 35 trays of eggs and 10 broilers during the same period. A tray of eggs costs sh. 13000 and a broiler is at sh. 18,000.

The owner of the farm decided to deposit the total sales from the poultry units in Centenary bank for 24 months at 3% simple interest rate.

Task:

(a) Display the information given in the easiest way.

(b) Using the information provided; find the total amount of money the owner of the farm would find in his Centenary bank account after 24 months.

PART II

*Answer **one** item from this part.*

Item 5: **(20 Scores)**

During a football training; the coach marked three points on the ground forming a triangle **OXY**. He labelled the displacement **OX** as vector **x** and displacement **OY** as **y**. he further placed points **A** on **OY** such that $\overline{OA}:\overline{AY}=1:3$ and **B** on **XY** such that $\overline{XB}:BY=2:3$.

Task:

(a) Using the knowledge of vectors; express **OA, XY, XB, OB** and **AX** in terms of vectors **x** and **y**.

(b) Given that **OC=*h*OB** and **AC=*k*AX**, express the position vector of **C** in terms of ;

(i) ***h*, x** and **y**

(ii) ***k*, x** and **y**

(c) Find the values of ***h*** and ***k*** and determine the ratios $\overline{AC}:\overline{CX}$.

Item 6: **(20 Scores)**

Mr. Tumusiime wishes to fence his courtyard to prevent goats from destroying his vegetable garden. He decides to use three posts **A, B** and **C**. he discovers that the distance $\overline{AB}=100m$, $\overline{BC}=92m$. His daughter, Susan discovers that angle **ABC** is **105°**.

Task:

(a)(i) By scale drawing, help Mr. Tumusiime come up with a circular fence inside all the three posts.

(ii) Measure the distance **AC**.

(b) Determine the area of the part within the three posts that was not fenced.