S475/1
SUBSIDIARY
MATHEMATICS
Paper 1
June/July 2023
$2\frac{2}{3}$ HOURS

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 minutes

INSTRUCTIONS TO CANDIDATES:

Attempt all **eight** *questions in* Section **A** *and any* **four** *from* Section **B with** at least one question from each part.

All necessary working must clearly be shown.

Any additional question(s) will not be marked.

Graph papers are provided.

Silent, non-programmable Scientific Calculators and Mathematical tables with a list of formulae may be used.

SECTION A

Answer **all** *questions in this* Section.

1. Use Crammers rule to solve the simultaneous equations: *(05 marks)*

$\mathbf{15x - 6y = 3}$.

$\mathbf{6x + 9y = 24}$

2. If A and B are two events such that $\boldsymbol{P(A) = 0.5}$, $\boldsymbol{P(B) = 0.7}$ and $\boldsymbol{P(AUB) = 0.8}$, find;

(i) **P(A∩B)**

(ii) $\boldsymbol{P(A \cap B')}$ *(05 marks)*

3. The roots of the equation $\mathbf{2x^2 - 7x + 4 = 0}$ are $\propto$ and β. Find the equations whose roots are $\frac{\mathbf{2}}{\boldsymbol{\beta}}$ and $\frac{\mathbf{2}}{\propto}$**.** *(05 marks)*

4. The 5th term of an arithmetic progression is 12 and the sum of the first 5 terms is 80. Determine the first term and the common difference. *(05 marks)*

5. Given that $\frac{2^5 x 4^{-x}}{\sqrt{8}} = \frac{1}{2}$. Find the value of x. *(05 marks)*

6. A blind folded mark man finds that on average, he hits the target 3 times out of 5 attempts. If he fires 4 shots. What is the probability of;

(a) More than two hits

(b) At least three misses. *(05 marks)*

7. The table below shows the number of text books owned by 10 students of a certain class and their total marks in an exam.

Student	A	B	C	D	E	F	G	H	I	J
Number of text books	5	8	2	9	7	5	3	10	1	4
Total marks in an exam	290	370	184	366	277	190	385	200	281	331

Calculate the rank correlation coefficient between the number of text books and the total marks. Comment on your result at 5% level of significance. *(05 marks)*

8. The letters of the word **COMMITTEE** are arranged in s row. Find the possible number of ways of arranging the letters of the word if two '**MM**' are separated. *(05 marks)*

SECTION B (60 MARKS)
Attempt four questions with at least one question from each part
PART 1

9. (a) Given that $M = \begin{pmatrix} \mathbf{1} & \mathbf{3} \\ \mathbf{2} & \mathbf{0} \end{pmatrix}$ and $\boldsymbol{N} = \begin{pmatrix} \mathbf{-3} & \mathbf{1} \\ \mathbf{3} & \mathbf{-2} \end{pmatrix}$, find $(\boldsymbol{MN})^{\mathbf{-1}}$.

(05 marks)

(b) Musa and Bob went for shopping. Musa bought 2 kg of Rice, $1500g$ of sugar and 3 kg of meat while Bob bought 1 kg of Rice, $500g$ of Tea leaves and 4 kg of meat. The cost per kg of Meat was 10,000/=, Rice was 3,000/=, sugar was 4,500/= and Tea leaves was 1,500/=.

(i) Write down the matrices for the items bought and for the prices of the items. *(02 marks)*

(ii) Using the matrices, determine the difference in the expenditure of Musa and Bob. *(08 marks)*

10. (a) Sketch the curve $\boldsymbol{y = 5 + 4x - x^2}$ *(10 marks)*

(b) Calculate the area bounded by the curve and the x – axis. *(05 marks)*

11. (a) Without using tables or calculators, find values of

(i) Sin 300^o

(ii) tan 390^o *(04 marks)*

(b) Given that angle A is reflex and that CosA = $^4/_5$, Find without using tables or calculators the value of tan 2A *(06 marks)*

(c) Solve the equation; $1 + cos\theta = 3\text{Sin}^2\theta$ for $0^o \leq \theta \leq 360^o$ *(05 marks)*

12. A hot body at a temperature of 100^0C is placed in a room of temperature of 20^0C. Ten minutes later, its temperature is 60^0C.

(i) Write down a differential equation to represent the rate of change of temperature, θ of the body with time, t.

(ii) Determine the temperature of the body after another 10 minutes.

(15 marks)

PART 2

13. A continuous random variable X has a probability density function $f(x)$ defined by

$$f(x) = \begin{cases} k(5-x) & ; \ 0 \leq x \leq 5 \\ 0 & ; \ otherwise \end{cases}$$

where k is a constant, show that $\boldsymbol{k = \frac{2}{25}}$

(i) The mean

(ii) The $P(1 \leq x \leq 3)$

(iii) Standard deviation *(15 marks)*

14. The table below shows the scores by 200 students in a mathematics test marked out of 40.

Scores	1 – 5	6 -10	11– 15	16 – 20	21 – 25	26 – 30	31 – 35
Cumulative frequency	3	22	60	129	174	195	200

(a) Calculate the;

(i) Mean score

(ii) Variance *(10 marks)*

(b) Draw a histogram and use it to estimate the modal score. *(05 marks)*

15. A certain type of water melon has a mass which is normally dis tribute with mean 1 kg and standard deviation 0.15 kg. Find;

(a) The probability that the mass of any mater melon taken at random will,

(i) Be greater than 0.79 kg

(ii) Lie between 0.85 kg and 1.15 kg *(07 marks)*

(b) The number of water melon out the 10,000 in a truck whose mass are

(i) Less than 1.13 kg

(ii) Between 0.75 kg and 1.28 kg *(08 marks)*

16. The following table shows the sugar cane production in tones from Busede sub county in each quarter of the years 2010, 2011, and 2012

Year	**1st quarter**	**2nd quarter**	**3rd quarter**	**4th quarter**
2010	449	564	701	348
2011	436	552	689	337
2012	415	526	663	317

(a) Calculate the four point moving averages. *(06 marks)*

(b) (i) On the same axes, plot and draw graphs of the original data and the four – point moving averages.

(ii) comment on the trend of sugar cane production. *(06 marks)*

(c) Use your graph in (b) to estimate the amount of sugar cane produced by the county in the 1st quarter of 2015. *(03marks)*

END