S475/1
SUBSIDIARY MATHEMATICS
Paper 1
20th February, 2025
$2\frac{2}{3}$ hours

PRE-REGISTRATION EXAMINATIONS-2025

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. Simplify $\frac{3-\sqrt{3}}{3+\sqrt{3}}$ and express your answer in the form $a - b\sqrt{c}$ hence find a, b and c. *(05 marks)*

2. If *A* and *B* are independent events such that $P(A) = \frac{1}{4}$ and $P(B) = \frac{3}{5}$ find: *(05 marks)*

(a) $P(AUB)$
(b) $P(A'UB')$

3. Solve the equation $sec^2\theta - 2sec\theta + 15 = 0$. *(05 marks)*

4. A certain poultry farm had ten thousand birds. Two thousand birds on this farm were diagnosed with a strange disease. If five birds were selected at random from the farm and diagnosed determine the probability that at least two were free of the disease. *(05 marks)*

5. Given that ${}^{n}C_3 = {}^{n}P_2$ find the value of n. *(05 marks)*

6. *X* has probability distribution as shown the table below.

X	1	2	3	4	5
P (X = x)	a	$3a$	$\frac{7}{20}$	$\frac{1}{5}$	$\frac{1}{20}$

Find the average of a and $E(x)$. *(05 marks)*

7. Given that: $= \frac{x^3+3x-1}{x^2}$, Find:

(a) $\frac{dy}{dx}$

(b) $\frac{d^2y}{dx^2}$ *(05 marks)*

8. The monthly price of a bunch of banana in 2015 is as follows;

Months	Jan	Feb	March	April	May	June	July	Aug
Price (Shs)	4500	5000	5200	5500	6000	6500	5700	7000

Calculate the 4-months moving average for the data. *(05 marks)*

SECTION B (60 MARKS)
PART ONE: PURE MATHEMATICS

Attempt at least ***one*** question from each part

9. (a) Given $\boldsymbol{A} = \begin{pmatrix} \mathbf{4} & \mathbf{8} \\ \mathbf{-12} & \mathbf{0} \end{pmatrix}$ $\boldsymbol{B} = \begin{pmatrix} \mathbf{2x} & \mathbf{-2} \\ \mathbf{2y} & \mathbf{5} \end{pmatrix}$ find values of x and y for which $\boldsymbol{AB = BA}$. *(08 marks)*

(b) Two customers A and B went for shopping.
A bought 3kg of posho, 2kg of sugar
and 1 ½ kg of meat, while B bought 2kg of posho, 1kg of tea leaves and 2 ½ kg of meat. The cost per kg of sugar was 3,500, meat was shs. 10,000. Posho was shs. 4,000 and tea leaves was shs. 2,500.

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

(ii) Use the matrices in b(i) above to determine the difference in expenditure. *(07 marks)*

10. **(**a) The vectors $\boldsymbol{m} = \begin{pmatrix} \mathbf{2} \\ \mathbf{3} \end{pmatrix}$ and $\boldsymbol{n} = \begin{pmatrix} \mathbf{-6} \\ \boldsymbol{p} \end{pmatrix}$ are perpendicular to each other.
Determine;

(i) The value of $\boldsymbol{p}$

(ii) $|\boldsymbol{2m + n}|$ *(08 marks)*

(b) Use matrix method to solve the simultaneous equations
$3x^2 + 5y = 2$

$2x^2 - 3y = 14$ *(07 marks)*

11. The gradient of curve at point P(x, y) is 4x + 3. If point A(3, 25) lies on the curve

(i) Find the equation of the curve

(ii) Determine the coordinates and nature of its turning point

(iii) Find the area enclose by the curve and the x- axis. *(15 marks)*

12. Mr. Kato is going to bake chocolate cakes and yellow cakes to sell. He wants at least two chocolate cakes. Besides, he wants more yellow cakes than chocolate cakes. Due to limited time and facilities, he cannot bake more than ten cakes. The chocolate cakes are to be sold for Shs. 1500 each and the yellow cakes for Shs. 1000 each. To make

profit, more than Shs. 8000 must be realized from the sales. (suppose he bakes *x* chocolate cakes and *y* yellow cakes).

(a) Write down **four** inequalities to represent this information. *(04 marks)*

(b) (i) On the same axes, plot the graphs of the inequalities and shade the unwanted regions. *(06 marks)*

(ii) List all the possible numbers of chocolate cakes and yellow cakes Mr. Kato can bake. *(03 marks)*

(c) How many cakes of each type should Mr. Kato bake in order to make the maximum profits? *(02 marks)*

PART ONE: STATISTICS

Attempt at least ***one*** question from each part

13. (a) If x is a normal random variable with mean 4 and variance 1.44. Find;

(i) $\boldsymbol{p(x > 5.3)}$

(ii) $\boldsymbol{P(2.8 < x < 4.6)}$ *(07 marks)*

(b) The life time of a certain type of component of a computer is normally distributed with an average life of 1120 hours of working and standard deviation of 20 hours. Determine the probability that a component lasts

(i) for less than 1150 hours

(ii) Between 1115 hours to 1145 hours *(08 marks)*

14. The table below shows the number of printed copies in thousands and their cost in millions.

Number of printed copies ***(x)*** *(000s)*	14	29	55	74	18	36	61	79
Cost of printing ***y*** *(000,000s)*	96	81	54	38	93	73	50	35

(a) Draw a scatter diagram to represent the data and comment. *(06 marks)*

(b) Calculate Spearman's rank correlation coefficient and comment.

(07 marks)

(c) Estimate the cost of printing 40,000 copes. *(02 mark)*

15. The table below shows the prices in US dollars and weights of the five components of an engine in 2020 and 2025.

Component	**A**	**B**	**C**	**D**	**E**
Price *($) 1998*	35	70	43	180	480
Price *($) 2005*	60	135	105	290	800
Weight	6	5	3	2	1

Taking 1920 as the base year:

(a) Calculate for 2025 the

(i) simple aggregate price index. *(05 marks)*

(ii) price relative of each component. *(05 marks)*

(iii) weighted aggregate price index. *(03 marks)*

(b) Estimate the cost of an engine in 1998 given that its cost in 2005 was US$ 1600. *(02 marks)*

16. In an investigation carried out, the masses of 50 animals were noted and recorded as below.

88	108	113	103	104	100	105	86	93	96
92	116	117	102	100	110	99	106	114	93
116	101	105	83	103	100	95	109	101	92
92	108	92	99	107	98	105	113	101	87
101	96	107	101	118	106	102	97	111	118

(a) Construct a frequency distribution table with equal class intervals of 5kg taking 85−89 as the first class.

(b) Calculate the mode weight. *(05 marks)*

(c) Draw a cumulative frequency curve and use it to estimate.

(i) Semi-interquartile range.

(ii) The 80^{th} percentile *(10 marks)*

END