S475/1
SUBSID. MATHEMATICS
PAPER 1
July/August 2023
$2^{2}/_{3}$ hours

WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

PAPER 1

2 hours 40 minutes

INSTRUCTIONS TO CANDIDATES:

- *Answer* **all** *the* **eight** *questions in section A and any* **four** *questions from section* **B**.
- *Any additional question(s) answered will* **not** *be marked.*
- **All** *working* **must** *be shown clearly.*
- *Each question in section* **A** *carries* **5** *marks while each question in section* **B** *carries* **15** *marks.*
- *Begin each answer on a fresh page.*
- *Graph papers are provided.*
- *Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.*

SECTION A (40 marks)

Answer **all** questions in this section.

1. The roots of quadratic equation $2x^2+5x-12=0$ are α and β.
   Determine value of $(\alpha-\beta)^2$. (05 marks)

2. Without using tables or calculator solve for x in
   (i) $2+3\log x = \log\left(\frac{1}{10}\right)$ (02 marks)
   (ii) $\left(9^x\right)\left(3^{x+1}\right)=81$ (03 marks)

3. Solve the equation $5\tan^2A-5\tan A=2\sec^2A$, for the range $0^0 \leq A \leq 360^0$. (05 marks)

4. Solve the differential equation $\frac{dy}{dx}=\frac{2x-1}{2y}$ given $y(2)=6$ (05 marks)

5. 10 packets of baking power had the following masses in grams:
   203, 205, 203, 207, 209, 208, 201, 204, 208, 202
   Find; (i) mean. (02 marks)
   (ii) standard deviation. (03 marks)

6. Given that A and B are mutually exclusive events such that P(A)= ½ and $P(A\cup B)=\frac{9}{10}$.
   Find; (i) $P(A^1 \cap B)$. (03 marks)
   (ii) $P(A^1 \cap B^1)$. (02 marks)

7. A random variable X has distribution.

x	-2	0	1	2
$P(X=x)$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$

   Find the; (i) expectation of X. (02 marks)
   (ii) variance of X. (03 marks)

8. The probability that a student guesses the answer correctly to a multiple choice question is 0.25. If a quiz has 15 multiple choice questions. Determine the probability that a student guesses correctly the answers to
   (i) exactly six questions. (02 marks)
   (ii) between three and six questions. (03 marks)

SECTION B (60 marks)

Answer any **four** questions from this section.

9. Points P, Q and R have position vectors $5\mathbf{j}$, $7\mathbf{i}$ and $5\mathbf{i} - 5\mathbf{j}$ respectively in the x – y plane.

(a) Find $4\mathbf{OP} + 3\mathbf{OQ} - 4\mathbf{OR}$ (04 marks)

(b) Determine;

(i) **PQ** and **PR** (04 marks)

(ii) **PQ. PR** (02 marks)

(iii) Angle QPR (05 marks)

10. The equation of a curve is $y = 3x^2 - 6x$

(a) (i) Find the intercepts. (02 marks)

(ii) Determine the turning point on the curve. (04 marks)

(iii) Find the nature of the turning point. (02 marks)

(iv) Sketch the graph of the curve. (02 marks)

(b) The curve and the line y = 9 intersect at the points (-1, 9) and (3, 9). Calculate the area of the region enclosed between the curve and the line. (05 marks)

11. (a) In how many different ways can the letters of the word REVERSES be arranged. (03 marks)

(b) In how many different sets of four questions can they be chosen from a total of six different questions of an examinations. (03 marks)

(c) If $\begin{pmatrix} x & -2 \\ -1 & y \end{pmatrix}\begin{pmatrix} 5 & 2 \\ 1 & 4 \end{pmatrix} = \begin{pmatrix} 18 & 0 \\ 0 & 18 \end{pmatrix}$ find the values of x and y. (04 marks)

(d) Use the matrix method to solve the simultaneous equations.

$8x - 2y = 28$

$5x - 9 = -3y$

12. Supporters of a certain soccer team wish to accompany their team for a soccer match away from home ground. They are to travel by a taxi and a mini-bus which have capacities of 16 people and 30 people respectively. The number of supporters to go will exceed 120. Each trip of taxi and mini-bus make costs Shs. 240,000 and Shs. 300,000 respectively. The money contributions for transportation of the supporters is Shs. 2,400,000. The number of trips made by taxi should not exceed those made by mini-bus by more than 2. If x and y are the number of trips made by taxi and mini-bus respectively, (05marks)

(a) Write the five inequalities representing the above information. (03marks)

(b) Plot on the same axes the above inequalities. (04marks)

(c) By shading the unwanted regions, show the regions satisfying the inequalities in (a) above. (03 marks)

(d) List the possible number of trips each vehicle will make, given that all the money for transport is to be used. (03 marks)

(e) What is the greatest number of supporters that was transported? (02 marks)

13. The data below shows the daily sales of phones in Adam's shop for two consecutive weeks.

Week 1:	10	9	6	11	14
Week 2:	9	8	8	13	12

(a) Calculate a five day moving average. (06 marks)
(b) On the same graph paper draw both
  (i) The graph of daily sales. (03 marks)
  (ii) The graph of 5 day moving average. (04 marks)
(c) Use your graph to find the number of phones that would be sold on the first day of the third week. (02 marks)

14. The prices of consumable items in the years 2021 and 2022 are shown in table below.

Item	2021	2022	Weight
Milk (per litre)	1200	1500	20
Eggs (per tray)	8000	1500	3
Sugar (per kg)	4500	5000	2
Rice (per kg)	3500	4000	4

Taking 2021 as the base year, calculate the
(a) Price index for each item. (04 marks)
(b) Simple aggregate price index. (06 marks)
(c) Weighted aggregate price index and comment on the cost of living. (05 marks)

15. The gestation period of cows is normally distributed with a mean of 8 months and standard deviation of 3 months.
(a) Determine the probability that a cow selected at random from a certain farm takes
  (i) Exactly 9 months. (03 marks)
  (ii) Less than $8^1/_2$ months. (03 marks)
  (iii) Between 8 months and 10 months. (05 marks)
(b) Assuming that there are 150 cows on the farm, what is the approximate number of cows which take more than 11 months? (04 marks)

16. The table below shows the marks awarded by two judges X and Y to ten entrants in an essay writing competition.

Entrants	A	B	C	D	E	F	G	H	I	J
Judge X	48	50	51	55	51	47	46	52	49	50
Judge Y	28	29	32	39	36	24	21	34	32	27

(a) (i) Plot a scatter diagram for the given data. (06 marks)
  (ii) Draw a line of best fit on the scatter diagram. (02 marks)
  (iv) Estimate the mark awarded by judge X for an entrant awarded 30 by judge Y. (02 marks)
(b) Calculate a rank correlation coefficient between the two judges and comment on your result. (05 marks)

END