S475/1
SUBSID. MATHEMATICS
Paper 1
July/August 2022
2⅔ hours

JOINT MOCK EXAMINATIONS, 2022

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 only* **four** *questions in section* **B**.

Any additional question(s) answered will **not** *be marked.*

Each question in section **A** *carries* **5** *marks while each question in section* **B** *carries* **15** *marks.*

All working must be shown clearly.

Begin each answer on a fresh paper.

Graph paper is provided.

Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

Where necessary, take acceleration due to gravity, $g = 9.8\ \text{ms}^{-2}$

SECTION A: (40 MARKS)

Answer **all** *questions in this section.*

1. Solve the equation $2\log_3 P + 3\log_P 3 - 5 = 0$ *(05 marks)*

2. The 8^{th} term of an AP is twice the third term and the sum of the first eight terms is 39. Find the sum of the first 21 terms of the progression. *(05 marks)*

3. Solve the simultaneous equations using Cramer's rule

$$2x + y = 3$$
$$4x = 10 + 2y$$ *(05 marks)*

4. Evaluate $\int_0^4 \sqrt{P}\,(P-2)\,dp$. *(05 marks)*

5. Given that $a = 3i - 4j$ and $b = -5i + 12j$. Find the angle between a and b. *(05 marks)*

6. Solve the equation
$4\cos x - 3\sec x = 2\tan x$ for $-180° \leq x \leq 180°$. *(05 marks)*

7. The marks obtained in Maths and Economics tests were as follows.

Maths	51	62	64	47	54	44	68	61	56
Economics	45	54	58	46	49	43	59	56	53

Calculate the rank correlation coefficient and comment on your result *(05 marks)*

8. A motorcycle moving in a straight line passes a point x with a velocity of 15 m s^{-1}. It then moves for 5 seconds with an acceleration of 2 m s^{-2}.

Calculate the;

(a) velocity of the motorcycle after 3 seconds. *(03 marks)*

(b) distance of the motorcycle from x after 3 seconds. *(02 marks)*

$\frac{\cos\theta}{\cos\theta} + \frac{\sin\theta}{\cos\theta} = \frac{1}{\cos\theta}$

$1 + \tan\theta = \sec\theta$

SECTION B (60 MARKS)

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

All *questions carry equal marks.*

9. The average prices of sugar in each third of a year over a period of time is given in Uganda Shillings in the table below.

Year	1st third	2nd third	3rd third
1998	4500	5000	5200
1999	5500	5700	6000
2000	6200	6500	6800
2001	7000	Y	

(a) Calculate the **three** point moving averages. *(05 marks)*

(b) On the same graph, plot the raw data and the moving averages. *(06 marks)*

(c) (i) Comment on the trend of prices of sugar for this period. *(01 mark)*

(ii) Use your graph to estimate the value of Y in the table. *(03 marks)*

10. (a) Find the equation of the tangent to the curve $y = 3x^2 + 7x - 2$ at the point where $x = -1$. *(05 marks)*

(b) Sketch the curve $y = (1 - x)(x - 5)$ clearly indicating on your sketch the coordinates of any turning points and any points where the curve cuts the axes. *(10 marks)*

11. A random variable X has probability density function.

$$f(x) = \begin{cases} kx & 0 < x < 1 \\ \left(\frac{k}{2}\right)x & 1 \le x \le 2 \\ 0 & \text{elsewhere} \end{cases}$$

Find

(a) (i) value of k, *(03 marks)*

(ii) $P(X > 1.5)$, *(02 marks)*

(iii) mode. *(01 mark)*

(b) $E(x)$. *(04 marks)*

(c) Standard deviation of X. *(05 marks)*

12. (a) Given that the equation $(4p+1)x^2-(p+10)x+2p=0$ has a repeated root, find the possible values of the constant p. *(05 marks)*

(b) Given that $\propto$ and β are the roots of the quadratic equation $3x^2-x-5=0$. Form an equation whose roots are $2\propto -\frac{1}{\beta}$ and $2\beta-\frac{1}{\propto}$. *(10 marks)*

13. The following table shows the prices and quantities of some four commodities A, B C, D for the years 2001 and 2002.

Item	Price per unit		Quantities	
	2001	2002	2001	2002
A	100	120	36	42
B	110	100	96	88
C	50	65	10	12
D	80	85	11	10

Using 2001 as the base year, calculate

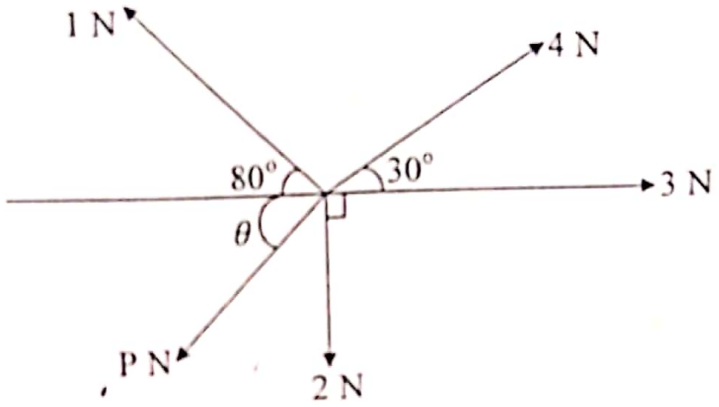
(a) price index for 2002, *(03 marks)*

(b) simple aggregate price index, *(04 marks)*

(c) weighted price index, *(04 marks)*

(d) value index. *(03 marks)*

14. (a) Forces of magnitudes 1 N, 4 N, 3 N, 2 N and P N act on a particle as shown below.



If the particle is in equilibrium, find the values of P and Q. (*05 marks*)

(b) ABCD is a rectangle. Forces of 8 N, 4 N, 10 N and 2 N act along AB, CB, CD and AD respectively in the directions indicated by order of the letters: Find the magnitude and the direction of the resultant force. (*10 marks*)

END