S475/1

Sub-maths

JULY/AUG 2024

2hours 40minutes

ASSHU ANKOLE JOINT MOCK EXAMINATIONS 2024

Uganda Advanced Certificate of Education

SUB SIDIARY MATHEMATICS

PAPER ONE

2 HOURS 40 MINUTES

INSTRUCTIONS

- Attempt **all** eight questions in section **A** and any **four** from section **B** choosing at least **one** question from each of parts **ONE** and **TWO**.
- Any additional question(s) will **not** be marked.
- All necessary working **must** be shown clearly.
- Silent, non-programmable scientific calculators and mathematical tables may be used.

SECTION A. (40Marks)

1. Events A and B are independent events $P(A) = 0.3$ and $P(B) = \frac{1}{4}$.

   Find the;

a) $P(AuB)$

b) $P(\bar{A}nB)$ ***(05 marks)***

2. Given that $\log_2 x^5 - \log_2 x^2 + \log_2 x^3 = 24$. Find the value of x. ***(05 marks)***

3. Given vectors $\underset{\sim}{a} = \begin{pmatrix} 6 \\ -2 \end{pmatrix}$ and $\underset{\sim}{b} = \begin{pmatrix} y \\ -10 \end{pmatrix}$ and $|2\underset{\sim}{a} - \underset{\sim}{b}| = 10$. Find the values of y.

   (05marks)

4. In a certain school, the average age of fifteen girls in S.4 is *15.8years* and the average age of boys and girls in S.4 is *16.5years*. If the sum of boys age is *687years*. Find the number of boys in S.4 of this school. Hence find the number of students in the school if the S.4 students are *8%* of the whole school.

5. The roots of the equation $2x^2 + 5x - 8 = 0$ are α and β. Determine the value of $(\alpha - \beta)^2$.

   (05 marks)

6. A continuous random variable X has a probability density function given by ***(05 marks)***

$$f(x) = \begin{cases} \frac{k}{3}x; 1 \le x \le 3 \\ 0; elsewhere \end{cases}$$

   Find the;

i) Value of constant k

ii) $E(X)$ ***(05marks)***

7. The monthly price of a bunch of a 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)***

8. Solve the equation $2\cos^2\theta - 3\sin\theta = 0$ for $0^0 \le \theta \le 360^0$ ***(05 marks)***

SECTION B. (60Marks)

Attempt four questions with at least one question from each part

PART ONE: PURE MATHEMATICS

9. (a) The sum of the 5^{th}, 6^{th}, and 7^{th} of an arithmetic progression is *99* and the 10^{th} term is *49*. Find the;

i) Common difference ***(07 marks)***

ii) Sum of the first *22* terms of the progression ***(02 marks)***

(b) (i) Simplify; $\frac{9^{1/2} \times 27^{2/3}}{64^{2/3} \times 16^{1/2}}$ *(03 marks)*

(ii) Express $\frac{5-3\sqrt{3}}{2-\sqrt{3}}$ in the form $a + b\sqrt{3}$ *(03 marks)*

10.(a) Given the matrices $A = \begin{pmatrix} -3 & x \\ 6 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} -6 & y \\ 12 & x \end{pmatrix}$ are such that $2A - B = 0$, determine the values of x and y. Hence find the determinant of the matrix AB. *(09 marks)*

(b) A family has two types of vehicles, one vehicle uses petrol and the other uses diesel. In November 2022, the family spent *shs850,000* to buy *100litres* of petrol and *80litres* of diesel. In December the expenditure increased by *shs335,000* and *150litres* of petrol and *100litres* of diesel were bought. Assuming the price of two commodities remained constant. Use matrix method to determine the price per liter of petrol and diesel. *(06 marks)*

11. The rate of cooling of a body placed in a room is directly proportional to the excess temperature of the body over the surrounding. The room's temperature is 20^0C and the body was initially at 100^0C, *10* minutes later it's temperature was 60^0C

a) Form a differential equation for the rate of change of temperature θ of the body with time *t*. *(03 marks)*

b) Solve the differential equation formed in *(a)*above *(08 marks)*

c) Determine the body temperature after a further*10* minutes *(04 marks)*

12. At a petrol station in Mbarara town, records show that the total volume of fuel sold is never more than *1,600litres* or less than *400litres* on any one day. The amount of petrol sold on any one day is always less than or equal to the amount of diesel sold. However, the amount of petrol sold was never more than three times the amount of diesel sold. Petrol costs *UGX4020 per litre* and diesel costs *UGX3980 per litre.*

a) Write four inequalities representing the above information

b) Represent the four inequalities on the graph and shade out the un-wanted region.

c) Determine the maximum amount the petrol station expects to receive from fuel sales on any one day. *(15 marks)*

PART TWO: STATISTICS

13.(a) Two events ***A*** and ***B*** are such that $P(\bar{A}) = 0.4, P(\bar{A} n \bar{B}) = 0.2$ and $P(\bar{A} u \bar{B}) = 0.45$. Find the;

i) $P(B)$

ii) $P(A/\bar{B})$ *(07 marks)*

(b)At a certain police check point, the probability that the driver is found drunk is *0.6*. Out of eight drivers checked, find the;

i) Expected number of drunkard drivers.
ii) Probability that exactly three drivers are found drunk.
iii) Probability that a least six drivers are not drunk.
iv) Mostly likely number of drunk drivers. ***(08 marks)***

14. The table below shows the marks scored by students in sub-mathematics in mock and post mock examination.

Mock	*35*	*68*	*55*	*25*	*45*	*75*	*20*	*90*	*55*	*80*	*60*
Post Mock	*86*	*70*	*80*	*90*	*86*	*68*	*98*	*50*	*75*	*65*	*75*

a) Plot a scatter diagram for the data. Comment on the relationship
b) Draw the best line of fit and use it to estimate the mock mark of a student who scored *60* in post mock.
c) Calculate the correlation coefficient between mock and post marks. Comment on your results at *5%* level of significance. ***(07marks)***

15. A discrete random variable x has a probability distribution function given by

$$f(x) = \begin{cases} \frac{k}{2}(2^x); x = 1,2,3 \\ kx; x = 4,5,6 \\ 0; otherwise \end{cases}$$

a) Find the;
i) Value of constant k. ***(03 marks)***
ii) $P(2 < x \leq 4)$ ***(03 marks)***
iii) $E(x)$ ***(03 marks)***
iv) Standard deviation of x ***(03 marks)***
b) Sketch the graph of the *p.d.f.* ***(03 marks)***

16. (a) The cost of building a house is calculated from the cost of cement, bricks, roofings and labour. The table below gives the costs of these items in 2010 and 2014

ITEM	**COST(UGX) PER UNIT**		**WEIGTS**
	2010	*2014*	
Cement	25,000	28,000	10
Sand(trip)	100,000	115,000	5
Bricks(trip)	200,000	220,000	5
Roofings	800,000	950,000	3
Labour	400,000	450,000	2

Using 2010 as the base year, calculate the;

i) Simple aggregate cost index and comment on the result *(03 marks)*

ii) Weighted average price index. Hence find the total expenditure for 2014 if the expenditure on the same items in 2010 was UGX.12,500,000. *(07marks)*

b) The price index of an item in 2015 using 2010 as the base year was130 and the index for the same item in 2012 using 2010 as the base year was 80. Calculate the;

i) Price index for the item in 2015 using 2012 as the base year

ii) If the price of the item in 2015 was UGX.39,000. Find its price in 2012 *(5marks)*

END