S.5 MATHEMATICS PAPER2 END OF TERM 2 2023

ATTEMPT ANY 13 QUESTIONS IN 3 HOURS

SECTION A(40 MARKS)

1. Events A and B are such that; $P(AUB) = \frac{19}{30}, P(A) = \frac{5}{15} and\ P(A/B) = \frac{5}{9}$.

Determine the; (a) $P(AnB)$ (03 marks)

(b)$P\left(A'/B\right)$ (02 marks)

2. If $f(2.09) = 1.9042, f(2.15) = 2.2345, f(2.19) = 2.4979\ and\ f(2.23) = 2.8198$. use linear interpolation or extrapolation to find;

(a)$f(2.11)$ (03 marks)

(b)$f^{-1}(3.0096)$ (02 marks)

3. The following were the scores in mathematics midterm examination.

Marks	20-30	30-40	40-45	45-55	55-65	65-75
Frequency density	0.5	1.6	2.4	2.0	1.8	0.6

Calculate the median (05 marks)

4. Show that if two events A and B are independent then their compliments are also independent. (05 marks)

5. Nine voters in Kampala and Jinja were asked to give the government scores out of 100 on each nine issues. The results are shown below.

Issues	A	B	C	D	E	F	G	H	I
Kampala	62	54	46	34	54	46	36	29	14
Jinja	76	56	46	37	35	27	46	17	17

Calculate the rank correlation coefficient between the voters in the two districts and comment on your results. (05 marks)

6. The table below shows the weight of 50 farm animals whose average weight is 62.8kg

Weight(kg)	0-20	20-40	40-60	60-80	80-100	100-120
No. of animals	5	x	10	y	7	8

Find the value of x and y (05 marks)

7. A discrete random variable X has the following probability distribution;

$P(X = 1) = n, P(X = 2) = P(X = 3) = 2n, and\ P(X = 4) = 4n$.Find the value of n and use it to find the mean (05 marks)

8. Given three decimal numbers $a = 12.23, b = 3.453\ and\ c = 4.1667$. Find the maximum and minimum value of $\left(\frac{1}{a} + \frac{b}{c}\right)$ (05 marks)

SECTION B (60 MARKS)

9. X is a discrete random variable such that; $P(X = x) = \begin{cases} kx; x = 1,2,43,4 \\ k(10 - x); \quad x = 5,6,7,8 \\ 0; elsewhere \end{cases}$

(a) find the value of the constant k, hence find

(i) expectation, E(X)

(ii) variance, Var(X)

(iii) Mode

(iv) $P((X \geq 6)/(X \leq 7))$ (12 marks)

10. The table below shows the distribution of heights of 134 students in a Maths class.

Heights	$20-<30$	$30-<35$	$35-<40$	$40-<55$	$55-<65$	$65-<80$	$80-<90$
No. of students	9	12	27	13	25	18	30

(a) Use the above data to calculate the;
(i)Mean
(ii) Standard deviation (06 marks)

(b) Construct a cumulative frequency curve (Ogive) and use it to find;
(i) Median
(ii) 40^{th} and 80^{th} percentile range (06 marks)

11. The table below shows the number of apples put in boxes A,B and C

Apples	Boxes		
	A	B	C
Green	4	7	3
Red	7	5	11

A box is randomly selected and two apples are randomly picked from it without replacement. Box A is twice as likely to be picked as B, while A and C have the same chances of being picked.

(a) Determine the probability that both apples are;
(i) Of the same colour
(ii) From box B, given that they are of the same colour (06 marks)

(b) If X is the random variable "number of green apples"

(i) Construct a probability distribution table for X.

(ii) Find the expected value of X. (06 marks)

12. (a) Determine the limits within which the exact value of $\frac{6.042-3.21}{12.1}$ lie.

(b) Given that x and y are approximate values with respective errors e_x and e_y. show that the maximum relative error in $\frac{x}{y}$ is given by $\left|\frac{e_x}{x}\right| + \left|\frac{e_y}{y}\right|$. (12 marks)

13. (a) Events A,B and C are such that $P(A) = x, P(B) = y \; and \; P(C) = x + y$.

If $P(AuB) = 0.6$ and $P(A/B) = 0.2$

(i) Show that $4x + 5y = 3$

(ii) Given that B and C are mutually exclusive and that $P(BuC) = 0.9$, determine another equation in terms $x \; and \; y$.

(iii) Find the value of $x \; and \; y$ and deduce whether A and B are independent events. (07 marks)

(b) Two independent events A and B are such that $P(A) = \frac{1}{2} \; and \; P(AuB) = \frac{2}{3}$ Find;

(i) $P(B)$

(ii) $P(A/B)$ (05 marks)