



**UGANDA INSTITUTE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
END OF SEMESTER ONE EXAMINATIONS**

ACADEMIC YEAR 2024/2025

DEPARTMENT: ICT

SEMESTER: ONE

PROGRAMME(S): HIGHER EDUCATION CERTIFICATE - ENGINEERING (HECE)

YEAR OF STUDY: ONE

COURSE: PROBABILITY AND STATISTICS

COURSE CODE : HECE113

DATE: SUNDAY 15TH, DECEMBER 2024

TIME: 9:00 AM – 12:00 NOON

DURATION: 3 HOURS

INSTRUCTIONS:

- (i) This paper contains EIGHT questions.**
- (ii) Attempt ONLY FIVE questions.**
- (iii) All questions carry equal marks.**
- (iv) Credit will be given for use of relevant examples and illustrations.**
- (v) Begin each number in on a new page of the answer sheet.**
- (vi) DO NOT write on this question paper.**

PROBABILITY AND STATISTICS

SECTION A [40 MARKS]

Attempt **ALL** the Questions in this Section.

1. A fair coin is tossed three times, what is the probability of picking at least two heads out of the three tosses given that each coin consists of a head (H) and a tail (T) **(4 marks)**

2. Events A and B are independent such that $P(A \cup B) = 0.8$, $P(A) = 0.5$

Find;

a) $P(B)$

b) $P(A^1 \cap B)$ **(4 marks)**

3. The table below shows that marks obtained by 8 students in math and physics.

Math (M)	60	80	75	85	68	90	95	78
Physics (P)	70	75	80	78	85	90	96	83

Find the spearman's rank correlation coefficient **(4 marks)**

4. A class performed an experiment to estimate the diameter of a circular object. A sample of five students had the following results in Centimetres; 3.13, 3.16, 2.94, 3.33 and 3.0. determine the sample

a) Mean

b) Standard deviation **(4 marks)**

5. Three boys A, B and C take part in a swimming competition. The respective probabilities of hitting the target are $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$. If they all throw at the target at once, find the probability that the target will be hit by all of them **(4 marks)**

6. Two events A and B are such that $P(A^1 \cap B) = 3x$, $P(A \cap B^1) = 2x$, $P(A^1 \cap B^1) = x$ and $P(B) = \frac{4}{7}$ Using a Venn diagram, find the value of,

a) X

b) $P(A \cap B)$ **(4 marks)**

7. The table below shows the mass of boys in a certain school

Mass (Kg)	15	20	25	30	35
Number of Boys	5	6	10	20	9

Calculate the mean mass **(4 marks)**

8. A random variable X of a discrete pdf is given as

$$f(x) = \begin{cases} Kx, & x = 1, 2, 3, 4, 5 \\ 0, & \text{otherwise} \end{cases}$$

Find

a) The value of K

b) $P(x > 2)$ **(4 marks)**

9. Events A and B are such that;

PROBABILITY AND STATISTICS

$$P(A \cap B) = \frac{1}{2} \text{ and } P(A/B) = \frac{1}{3}$$

Find;

a) $P(B)$

b) $P(B \cap A^1)$

(4 marks)

10. Given the following set of values: 2, 1, 3, 4, 2, 6, 3, 8, 2, 9

Find

a) The median value

b) Modal value

(4 marks)

SECTION B [60 MARKS]

Attempt **ONLY THREE** Questions in this Section.

Question 1

a) Event A and B are such that $P(A^1 \cap B) = 0.3$, $P(A \cup B) = 0.8$ and $P(A \cap B) = 0.2$

Find

i) $P(B)$

ii) $P(A)$

iii) $P(A^1 \cup B)$

iv) $P(A^1 \cap B^1)$

v) $P(A^1 \cup B^1)$

(2 marks @)

b) In an experiment, two fair dice numbered from 1 to 6 are simultaneously tossed, determine the probability that;

i) A sum of either 5 or a sum of a prime number is obtained

ii) A sum of at least 9 is obtained

(10 marks)

Question 2

a) Three items are randomly picked from a bag containing 10 defective (D) and 30 non-defective (N) items. Find the probability that $\frac{2}{3}$ of these items are defectives if:

i) The items are picked with replacement

(4 marks)

ii) The items are picked without replacement

(4 marks)

b) Two baskets A and B contain similar balls. A contains 8 white and 5 red balls whereas B contains 10 white and 6 red balls, a ball is randomly drawn from A and transferred to B, a ball is then randomly drawn from B. find the probability that it will be white.

(4 marks)

c) In a manufacturing industry, there are two different machines A and B. 20% and 80% of the items are produced by A and B respectively. It has been established that 5% of the items produced by A and 8% of the items produced by B are

PROBABILITY AND STATISTICS

defective. If one item is selected at random from the lot produced, determine the probability that;

- i) It is defective **(4 marks)**
- ii) It is produced by A given that it is defective **(4 marks)**

Question 3

a) A random variable X of a p. d. f is given by:

$$f(x) = \begin{cases} Ax(6-x)^2, & 0 \leq x \leq 6 \\ 0, & \text{else where} \end{cases}$$

- i) Find the value of A **(3 marks)**
- ii) Calculate the mean **(3 marks)**
- iii) Calculate the mode **(3 marks)**
- iv) Calculate the median **(3 marks)**

b) A continuous random variable has a P. d. f given by

$$f(x) = \begin{cases} \frac{1}{4}x, & 0 \leq x \leq 2 \\ \frac{1}{4}(4-x), & 2 \leq x \leq 4 \\ 0, & \text{otherwise} \end{cases}$$

Find;

- i) $P(x \leq 1)$ **(2 marks)**
- ii) $P(X \geq 3)$ **(3 marks)**
- iii) $P(1 \leq X \leq 3)$ **(3 marks)**

Question 4

The heights (cm) and ages (years) of a random sample of farmers are given in the table below:

Heights (cm)	156	151	152	160	146	157	149	142	158	140
Ages (years)	47	38	44	55	46	49	45	30	45	30

- a) i) Calculate the rank correlation coefficient **(6 marks)**
ii) Comment on your result **(2 marks)**
- b) Plot a scatter diagram for the data. Hence draw a line of best fit **(8 marks)**
- c) Use your diagram in (b) to find;
 - i) Y when X=147 **(2 marks)**
 - ii) X when Y = 43 **(2 marks)**

PROBABILITY AND STATISTICS

Question 5

a) Given the information in the table below

Classes	f
1.0-1.9	3
2.0-2.9	7
3.0-3.9	8
4.0-4.9	2
5.0-5.9	15
6.0-6.9	5
7.0-7.9	6
8.0-8.9	4

Find the;

- i) Mean value using assumed mean of 4.45
- ii) Standard deviation
- iii) Mode
- iv) Median

(b) Use the information in (a) to draw an Ogive

(15 marks)

(5 marks)

END