**UGANDAMARTYRS UNIVERSITY**
**NKOZI**

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**UNIVERSITY EXAMINATION**
**May 2023**

**FACULTY OF SCIENCE**

END OF SEMESTER TWO FINAL ASESSMENT

Bachelor Science with Education
Year One

**ELEMENTS OF PROBABILITY**

**DATE**: Thursday 24/5/2023

**TIME: 09:30 – 12:30 Pm**

**DURATION**: 3 hours

**VENUE**:

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*Instructions:*

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1. *Carefully read through ALL the questions before attempting*
2. ***ANSWER FOUR (4) QuestionsONLY**. (Each question carries equal marks)*
3. *No **names** should be written anywhere on the examination book.*
4. *Ensure that your **ID number** is indicated on all pages of the examination answer booklet.*
5. *Ensure your work is **clear** and **readable**. Untidy work shall be penalized*
6. *Any type of examination Malpractice will lead to automatic disqualification*

[02 ma

7. Do not write anything on the questions paper.

## QUESTION 1

(a) An experiment has five possible outcomes for X: 0, 1,2,3,4. The probability that each of these outcomes occurs is x/10.

Determine, (i) the expected value **[05 marks]**

(ii) Variance **[05 marks]**

(iii) Standard deviation of X for the experiment? **[05 marks]**

(b) The NIC insurance company insures 100,000 cars. Their records indicate that during a year they will pay out the following for accidents;

| X in $ (Dollars) | 100,000 | 50,000 | 25,000 | 5,000 | 1,000 |
|---|---|---|---|---|---|
| Pr(X= x) | 0.0001 | 0.001 | 0.002 | 0.008 | 0.02 |

What amount of money would the company expect to pay per car for accidents? **[10 marks]**

## QUESTION 2

(a) Briefly explain the following terms as applied to probability theory

(i) Possibility space

(ii) Mutually exclusive events

(iii) Statistically independent events

(iv) Un Certainty situation **[2 marks @]**

(b) Bakyala kweterana group, one of the social support organisations from Mbarara City saved money for investment. The management wanted to start two projects (I & II). Below are expected sales from the projects.

| **PROJECT I** | | **PROJECT II** | |
|---|---|---|---|
| SALES ($) | Probability | SALES ($) | Probability |
| 8,000 | 0.30 | 15,000 | 0.10 |
| 8,500 | 0.50 | 8,000 | 0.70 |
| 10,000 | 0.20 | 5,000 | 0.20 |

**The firm's profit is 80 % of the sales.**

(i) Calculate the expected profit under each project. **[08 marks]**

(ii)Which project would you recommend to the management for the better returns?

**[02 marks]**

©Calculate the standard deviation of the distribution of the profits for each project **[05 marks]**

(d) As a risk expert, give advice on the best project? **[02 marks]**

## QUESTION 3

a) Define the terms:
   i. Random Variables
   ii. Continuous random variable **[ 2 marks @]**

b) A box contains 9 blue balls and 5 green balls. 2 balls are picked from the box one after the other. Find the probability of picking one blue and one green in any order given:
   i. The first ball is not replaced
   ii. The first ball is replaced **[ 5marks @]**

c) A continuous random variable has probability density function as

$F(x) = \{kx^2 \quad 0 \leq x \leq 4$

$0 \quad$ Elsewhere

   i. Find the value o f k **[ 5 marks]**
   ii. Calculate the E(X) and Var(X) **[3 marks @]**

## QUESTION 4

(a) What is statistics? **[02 Marks]**

(b) List common departments where statisticians work? **[08 marks]**

(c) State the roles of statisticians in governmental and non-governmental departments **[15 Marks]**

## QUESTION 5

(a).(i) What is correlation? **[02 marks]**

(ii) List three types of correlation, illustrating clearly using scatter diagrams to define them. **[06 marks]**

(b) The table below displays data that was collected when a procurement manager wanted to find out whether there was a relationship with the age of vehicles and cost of maintaining them.

| Age of Vehicle (x) | 5 | 10 | 15 | 20 | 25 |
|---|---|---|---|---|---|
| Cost of maintenance (y) '000 | 100 | 200 | 250 | 310 | 360 |

(i) Calculate the correlation coefficient **[06 marks]**

(ii) What do you have to say about the relationship between the two? **[03 marks]**

(iii) Calculate the coefficient of determination and give the interpretation of the coefficient. **[08 marks]**

**QUESTION 6**

(a) (i) What is sampling? **[2 marks]**

(ii) Why is sampling very important in business surveys? **[10 marks]**

**(b)** Distinguish between probability sampling and non-probability sampling and give the examples of each. **[13 Marks]**

**END**

$\frac{S_{xy}}{S_x}$ $a = \frac{\Sigma y}{n} - b\frac{\Sigma x}{n}$ $y = ax + b$