UGANDA MARTYRS UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF NATURAL SCIENCES

SEMESTER I EXAMINATIONS

FIRST YEAR EXAMINATION FOR

BAEAM, BSc in Agriculture, BAM, Acct & Finance, BSc in Statistics/Economics

BUSINESS STATISTICS / INTRODUCTION TO STATISTICS

DATE: 12th December 2022

TIME: 9:30 – 12:30pm

DURATION: 3 Hrs

INSTRUCTIONS

1. Carefully read through **ALL** the questions before attempting
2. Attempt any **FOUR** of the six questions
3. Ensure that your **Reg number** is indicated on all pages of the examination answer booklet
4. Ensure your work is **clear** and **readable**. Untidy work shall be penalized
5. Any type of examination malpractice will lead to automatic disqualification
6. Calculators and mathematical tables may be used

1. The marks of 10 students in Arithmetic and Algebra are given in the table below.

Student	A	B	C	D	E	F	G	H	I	J
Arithmetic	49	60	41	34	21	42	43	65	45	63
Algebra	39	74	33	32	13	31	34	71	57	40

Calculate

(a) [**6 marks**] the Person's correlation coefficient

(b) [**6 marks**] the Spearman's rank correlation coefficient

(c) [**6 marks**] the Kendall's rank correlation coefficient

(d) [**4 marks**] the regression line of Algebra on Arithmetic

(e) [**3 marks**] the marks of Algebra if a student gets 30 in Arithmetic.

2. The profit earned by a company is given as follows:

Profit earned (in Ushs '000)	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29
No. of company	4	20	46	18	10	2

Calculate for the distribution:

(a) [**4 marks**] The lower quartile, Q1
(b) [**4 marks**] The upper quartile, Q3
(c) [**2 marks**] The semi inter-quartile range
(d) [**3 marks**] The harmonic mean
(e) [**5 marks**] The geometric mean
(f) [**4 marks**] The quadratic mean
(g) [**3 marks**] The mean deviation

3. (a) In a container there are 6 black balls and 4 white balls. Two balls are selected in succession without replacement. What is the probability that

(i) [3 marks] the two balls are black.
(ii) [3 marks] the two balls are white
(iii) [4 marks] the two balls are of the same colour
(iv) [4 marks] the two balls are of different colour

(b) A box contains 36 beads, 28 of which are white and the rest yellow. One bead is picked from the box at random and not replaced. A second bead is then picked at random. Find the probability that

(i) [3 marks] the first bead picked is white

(ii) [3 marks] the second bead picked is yellow
(iii) [3 marks] both beads picked are white
(iv) [4 marks] both beads picked are yellow

4. (a) Let A and B be events such that P(A) = 0.4 and P(B) = 0.3. Find $P(A \cup B)$ assuming

(i) [**2 marks**] A and B are mutually exclusive

(ii) [**4 marks**] A and B are statistically independent

(b) If the probability that an individual suffers a bad a reaction from injection of a given serum is 0.001, determine the probability that out of 2000 individuals

(i) [**2 marks**] exactly 3

(ii) [**3 marks**] between 4 and 6 inclusive

(iii) [**3 marks**] more than 2 individuals will suffer a bad reaction

(c) A discrete random variable X has a probability function

$$f(x) = \begin{cases} \frac{a}{2x}, x = 1,2,3,4 \\ 0,....elsewhere \end{cases}$$

Determine
(i) [**3 marks**] the value of a
(ii) [**3 marks**] the expectation of X
(iii)[**5 marks**] The variance and standard deviation of X

5. The individual output of a group of fifty workers of a road construction company is shown in the table below:-

94	83	78	76	88	86	93	80	91	85
99	80	75	93	101	82	82	89	72	89
90	84	97	72	83	98	77	87	82	83
71	98	80	103	97	87	92	88	84	88
81	80	95	81	86	85	75	83	82	87

(i) **[8 marks]** Construct a frequency distribution table of class width 5 starting from 70 – 74

Determine

(ii) **[4 marks]** the mean

(ii) **[4 marks]** the median

(iii) **[4 marks]** the mode

(iv) **[5 marks]** the standard deviation

6. (a) The weight of male reindeer of Rudolph is normally distributed with mean 102.4 kg and standard deviation 13.9 kg.
   (i) **[3 marks]** What proportion of these reindeers would weigh more than 118.0 kg.
   (ii) **[4 marks]** What is the probability that the weight is between 100 and 120 kgs?
   (iii) **[4 marks]** If 36 reindeer are randomly selected and their average weight calculated, what is the probability that the mean weight is less than 100.0kg

   (b) A certain firm sells maize flour in bags of mean weight 40 kg and standard deviation of 2 kg. Given that the weight is normally distributed, find:
   (i) **[4 marks]** The probability that the weight of any bag taken at random will lie between 41.0 and 42.5 kg.
   (ii) **[3 marks]** The percentage of bags whose weight exceeds 43 kg
   (iii)[3 marks] The percentage of bags whose weight is less than 30 kgs
   (iii)**[4 marks]** The number of bags rejected out of a 500 bag purchase by a retailer whose consumers cannot accept a bad whose weight is below 38.5 kg.