BOTSWANA COLLEGE OF DISTANCE AND OPEN LEARNING

In Collaboration with

ZIMBABWE OPEN UNIVERSITY

BACHELOR OF COMMERCE

(Human Resources Management & Industrial Relations)

BUSINESS STATISTICS
(BS221)

Sessional Examination

Time: 3 Hours

Marks: 100

Instructions:

1. The examination consists of three sections: A, B and C.
2. Begin each answer to a new question on a new page.
3. Answer questions according to instructions given in each section.
4. Write answers in the answer booklet provided.
5. Write in grammatical English.

SECTION A –SHORT ANSWER QUESTIONS

[60 marks]

Answer all questions in this Section.

1. For each of the following random variables indicate the data type (i.e. discrete or continuous).

a. Among campus vending machines, 14 are found to be defective. **(2marks)**

b. Today's records show that 25 employees were absent **(2marks)**

c. The car weighs 1430 kilograms **(2marks)**

d. Of all students who took the test, 49 failed. **(2marks)**

e. Of the respondents, 423 are women. **(2marks)**

2. For each of the following random variables indicate the data type (ratio, interval, ordinal or nominal)

a. In a sample of 36 batteries, 12 were rated "good", 16 were rated "better" and 8 were rated "best" **(2 marks)**

b. The number of life policies issued per day **(2 marks)**

c. Body temperatures (in degrees Celsius) of hospital patients. **(2 marks)**

d. The number of pages in a textbook **(2 marks)**

e. Times (in minutes) of runners in a marathon **(2 marks)**

3. The pulse rates (number of beats per minute) of 12 male statistics students were

82	74	77	62	78	58
85	74	66	77	58	80

Find the:

a. Range **(2 marks)**

b. Arithmetic mean **(2 marks)**

c. Mode **(2 marks)**

d. Median value **(2 marks)**

e. Which central location measure would you choose? Explain why? **(2marks)**

4. Read the following information and answer questions that follow.

The following table shows the frequency table of lottery numbers selected in a week.

Number	Frequency
1-5	3
6-10	5
11-15	9
16-20	7
21-25	6

a. Construct a cumulative frequency table. **(2 marks)**

b. Draw a cumulative frequency graph. **(4 marks)**

c. Find the median. **(4 marks)**

5. Read the following information and answer questions that follow.

The following table shows the number of shares traded on the Gaborone Stock exchange in half-hourly intervals.

Shares traded (in millions)	Number of half-hourly periods
5-9	8
10-14	17
15-19	9
20-24	3
25-29	2
30-34	1

Find the:

a. Variance **(6 marks)**

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

6.

(a). State two actors that should be considered when preparing an index number. **(2 marks)**

(b). Read the following information and answer questions that follow.

The table below shows details of sales of four (4) items for the years 2015 and 2016.

Item	YEAR 2015		YEAR 2016	
	Price (Pula)	Quantity (kg)	Price (Pula)	Quantity (kg)
A	20	8	40	6
B	50	10	60	5
C	40	15	50	10
D	20	20	20	15

Considering 2015 as the base year, calculate the Laspeyer's Price Index for the year 2016.

(8 marks)

SECTION – B **[40 MARKS]**

Answer any two questions from this Section.

Question 1

(a). The time taken to install a new telephone is found to be normally distributed with a mean time equal to 45 minutes and a standard deviation of 8 minutes. For a new installation, what is the probability that it will:

i. Take between 45 and 51 minutes? **(3 marks)**

ii. Take less than 40 minutes? **(3 marks)**

iii. Be more than 51 minutes **(3marks)**

(b). Read the following information and answer questions that follow.

The years of experience and the annual sales of a company are recorded below.

Years of experience (x)	Annual sales (y)
8	56
5	44
11	79
13	72
10	70

i. Calculate correlation coefficient of the data and comment on your results. **(5marks)**

ii. Find the regression equation that can be used to predict annual sales given the years of experience. **(4 marks)**

iii. Use the regression equation to predict annual sales for a sales person with nine years of experience. **(2 marks)**

Question 2

a. Explain and illustrate by means of diagrams the following:

i) Symmetrical distribution **(2 marks)**

ii) Negatively skewed distribution **(2 marks)**

iii) Calculate the Pearson skewnesss give mean = 14.125, median = 14.389 and standard deviation = 5.95 and comments on the answer. **(4 marks)**

b. Interpret the following values of r. **(3marks)**

i) r = -1

ii) r = 0

iii) r = 1

c. Define statistical significance level. State the difference between a one-tailed test and a two –tailed test using diagrams. **(4 marks)**

d. The management of BOCODOL states that the mean age of their students is 25 years. Records of a random sample of 100 students give a mean of 28.4 years. Using a population standard deviation of 8 years, test at 5% significance level whether there is evidence that the management's claim is incorrect. State clearly your null and alternative hypothesis. **(5 marks)**

Question 3

a. State the central theorem and when it can be used. **(4 marks)**

b. State any two characteristics of the following distributions:

i) Binomial distribution **(2 marks)**

ii) Normal distribution **(2 marks)**

iii) Poisson distribution **(2 marks)**

c. The fuel consumption of a new model of car is being tested. In one trial, 50 cars are chosen at random, were driven under identical conditions and the distances, X km, covered on 1 litre of petrol were recorded. The results gave the following totals

$\sum x=525$, $\sum x^2=5625$

Calculate a 95% confidence interval for the mean petrol consumption in km/hr of this type **(6 marks)**

d. Each member of class of a 25 boys supports only one of the three football teams. 13 support rollers, 6 support Notwane and 6 support Gaborone United. If a boy is to be chosen at random , what is the probability that:

i. He will support Rollers? **(1 mark)**

ii. The probability that if two boys chosen will support the same team? **(3 marks)**

END OF PAPER

List of Formulae

Probability Distributions

Poisson Probability Distribution

$$P(x) = \frac{e^{-a}a^{x}}{x!}$$

Normal Probability Distribution

$$z = \frac{x-\mu}{\sigma}$$

Binomial Probability Distribution

$$P(x) = \frac{n!* p^{x}q^{n-x}}{x! *(n-x)!}$$

Simple Linear Regression Analysis

$$b = \frac{n\sum XY - \sum X \sum Y}{n\sum X^{2} - (\sum X)^{2}}$$

$$a = \frac{\sum Y - b\sum X}{n}$$

Probability

Conditional Probability

For two events A and B, $P(A/B) = \frac{P(A \cap B)}{P(B)}$

For non-mutually exclusive events A and B

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Combinations

$${}^{n}C_{r} = \frac{n!}{r!(n-r)!}$$

Permutations

$${}^{n}P_{r} = \frac{n!}{(n-r)!}$$

Measures of Central Tendency/Dispersion

Ungrouped Data

Samples mean $\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$

Sample Variance $s^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}$

Mean Absolute Deviation: $MAD = \frac{\sum_{i=1}^{n} |x_i - \bar{x}|}{n}$

Grouped Data

$Mean = \bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} = \frac{\sum_{i=1}^{n} x_i}{\sum f_i}$

$Median = O_{me} + \frac{c(\frac{n}{2} - f(<))}{f_{me}}$

$Mode = O_{mo} + \frac{c(f_m - f_{m-1})}{2f_m - f_{m-1} - f_{m+1}}$

Lower Quartile $Q_1 = O_{q1} + \frac{c(\frac{n}{4} - f(<))}{f_{q1}}$

Upper Quartile $Q_1 = O_{q3} + \frac{c(\frac{3n}{4} - f(<))}{f_{q3}}$

Index Numbers

Laspeyres Price Index

$LPI = \frac{\sum P_n Q_0}{\sum P_0 Q_0} * 100\%$

Laspeyres Quantity Index

$LQI = \frac{\sum P_0 Q_n}{\sum P_0 Q_0} * 100\%$

Paasche Price Index

$PPI = \frac{\sum P_n Q_n}{\sum P_0 Q_n} * 100\%$

Paasche Quantity Index

$PQI = \frac{\sum P_n Q_n}{\sum P_n Q_0} * 100\%$

The Fishers Price Index and Fishers Quantity Index can be calculated as follows:

$Fishers\ PriceIndex = \sqrt{LPI * PPI}$

$Fishers\ QuantityIndex = \sqrt{LQI * PQI}$
