



Strathmore
UNIVERSITY

**SCHOOL COMPUTING AND ENGINEERING SCIENCES
BACHELOR OF BUSINESS INFORMATION TECHNOLOGY/
COMPUTER NETWORKS AND CYBER SECURITY
END OF SEMESTER EXAMINATION
CNS 2206/BBT 2206: PROBABILITY AND STATISTICS 1**

DATE: 4 DECEMBER 2023

TIME: 2 HOURS

INSTRUCTIONS:

1. This examination consists of FIVE questions
2. Answer Question ONE (Compulsory) and any other TWO questions.

Question One (30 Marks)

(a) Differentiate between the following terms as applied in statistics

- i Measures of central tendency and measures of dispersion [1 Mark]
- ii Inferential statistics and descriptive statistics [1 Mark]
- iii An event and an experiment [1 Mark]

(b) Estimate the lower and upper quartiles, 7th decile and 23rd percentile of the following data

Observation	1	2	4	8	16
No of observations	3	2	5	6	4

[6 Marks]

(c) A financial consultant did a survey about the amount of money spent by 120 women while Christmas shopping. The cumulative frequency table shows this information.

Amount < \$ x	50	100	150	200	250	300
No. of Women(Cumulative frequency)	6	30	80	100	112	120

- i. Draw a cumulative frequency diagram hence estimate the median of the amounts of money spent by 120 women. [4 Marks]
 - ii. The consultant then surveyed men about the amount of money they spent while Christmas shopping. The median was \$160. Compare the amount of money spent by women with the amount of money spent by men. [1 Mark]
 - iii. Estimate the arithmetic mean, mode, and standard deviation of the amount of money spent by the 120 women [7 Marks]
 - iv. Estimate the first quartile and the seventh decile [4 Marks]
- (d) Using well labelled diagrams, illustrate symmetric, skewed to the left and to the right distributions, indicating the positions of mean, median and the mode. [5 Marks]

Question Two (20Marks)

- (a) The table shows the heights of 90 students in a class .

Height	140-144	144-148	148-152	152-156	156-160	160-164
No of students	14	15	18	17	15	11

- i. Calculate the mean height [3 Marks]
 - ii. Calculate the modal height [3 Marks]
 - iii. Estimate the variance [4 Marks]
 - iv. Estimate the coefficient of quartile deviation [6 Marks]
- (b) Consider the following distributions:

	Distribution X	Distribution W
Mean	80	94
Median	79	90
Mode	81	92
Standard deviation	8	12

Calculate the difference in variability of the two distributions [4 Marks]

Question Three (20Marks)

- (a) Define the term correlation analysis. [2 Mark]
- (b) In an attempt to increase the yield (Kg/h) of an industrial process, a technician varies the percentage of a certain additive used, while keeping all other conditions as constant as possible. The results are shown below.

%Additive	12.3	13.7	14.5	11.2	13.2	14.5	12.2
Yield	6.25	8.02	9.42	5.27	7.21	8.71	5.68

- i. Draw a scatter plot for this data and comment on its shape. [2 Marks]

- ii. Find the correlation coefficient between percentage additive and yield. [4 Marks]
- iii. Determine the least squares regression equation of yield on percentage additive [4 Marks]
- iv. Estimate the yield for an additive at 14.0%.
- v. Estimate the coefficient of determination hence interpret your result. [2 Marks]

(c) The score of twelve students in two tests for the same unit were as follows:

Test A	13	6	15	18	20	18	22	14	20	13	15	11
Test B	10	3	15	21	10	16	10	7	15	21	18	15

Calculate Spearman's rank correlation coefficient for the two sets of marks. [6 Marks]

Question Four (20Marks)

- (a) Define a sample space [2 Marks]
- (b) Given two events A and B in the same sample space such that $P(A) = 0.59$, $P(B) = 0.3$ and $P(AB) = 0.21$. Find;
 - i. $P(A \cup B)$ [2 Marks]
 - ii. $P(A'B)$ [2 Marks]
 - iii. $P(AB')$ [2 Marks]
 - iv. $P(A \cup B')$ [2 Marks]
- (c) A certain manufacturing process yields electrical fuses of which, in the long run 15% are defective. Find the probability that in a random sample of size $n=15$, fuses selected from this process, there will be
 - i. No defective fuse [2 Marks]
 - ii. At least two defective fuses [2 Marks]
 - iii. At most one defective fuse [2 Marks]
- (d) Two computers Acer and Dell are to be marketed. A salesman who is tasked with finding customers for them has 60% and 40% chances respectively of succeeding in the case of an Acer and a Dell. The computers can be sold independently. Given that at least one computer has been sold, find the probability that it is an Acer. [4 Marks]

Question Five (20Marks)

(a) For a discrete random variable Y the probability distribution is

y	1	2	3	4
$f(Y = y)$	$\frac{4}{10}$	$\frac{3}{10}$	$\frac{2}{10}$	$\frac{1}{10}$

calculate

i. Expectations and variance of Y [4 Marks]

ii. Expectation and variance of $X=2y+4$ [4 Marks]

(b) The following descriptive statistics were calculated from a grouped frequency data with 35 observations

$$\sum fx = 1450, \sum f(x - \bar{x})^2 = 11,428, \sum f(x - \bar{x})^3 = -105,604,$$

$$\sum f(x - \bar{x})^4 = 2,004,376$$

Find the moment coefficient of skewness and kurtosis hence interpret your results [12 Marks]