

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

BACHELOR OF COMMERCE HONOURS DEGREE

QUANTITATIVE ANALYSIS FOR BUSINESS-CIN 1207

MAY/JUNE 2011 FINAL EXAMINATION

DURATION: 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Answer all questions, i.e. parts (a) to (h), in section A.
2. Choose and answer five(5) questions, from questions 2 to 7, in section B.
3. You may use a non-programmable scientific calculator.
4. Statistical tables will be provided.
5. Graph Paper will be provided on request.

SECTION A (ANSWER ALL QUESTIONS, NAMELY PARTS (a) To (h)

[30 marks]

QUESTION ONE

- a) An analysis of vitamin A content of a random sample of 64 school lunches produced a sample mean equal to 12,5 milligrams and a variance of 25 square milligrams. Find a 95% confidence interval estimate for the mean amount of Vitamin C contained in one of the school's lunches. Interpret the interval. **[2 marks]**
- b) You wish to estimate the average daily yield, μ , of a chemical, and you wish the error of estimation to be less than 5 tons with a probability of 0.99. What should the sample size, n , be? **[5 marks]**
- c) A consignment of books has to comply with the requirement that there has to be less than 2 errors per page for the consignment to be acceptable. You have the information that typing errors follow a Poisson distribution and the average number of errors in typing these books is found to be four(4) errors per page. Find the probability that a given consignment of books is accepted. **[5 marks]**
- d) Define:
- i) Type I error. **[2 marks]**
 - ii) Type II error **[2 marks]**
- e) What is the effect on the standard error of the mean, of increasing the sample size 100 fold? **[4 marks]**
- f) How many committees comprising 3 women and 2 men can be selected from 5 women and 4 men? **[2 marks]**

g) What measure of central tendency is most suited when a distribution of values is highly skewed? [1 mark]

h) Use diagrams to illustrate the concept of SKEWNESS. [6 marks]

i) A statement such as, “ A typical Zimbabwean eats sadza” would suggest which of the following measures?

Mean Median Mode [1 mark]

SECTION B: CHOOSE AND ANSWER FIVE (5) QUESTIONS ONLY, OUT OF SIX(6)
[70 marks]

QUESTION ONE

A consignment of a certain component is known to be 10% defective. If the consignment has less than two defective components, the consignment is accepted. If the consignment has three(3) or four(4) defective components, it is returned to the supplier for improving by reducing defective components. If the consignment has at least five(5) defective components, it is rejected outright. A random sample of ten(10) components is selected from a consignment just received, to determine the number of defective components. Find the following:

- i) The probability that the consignment is accepted. [3 marks]
- ii) The probability that the consignment is returned to the supplier for improvement. [3 marks]
- iii) The probability that the consignment is rejected outright. [3 marks]
- iv) Find the mean, variance and standard deviation for this distribution.

[1, 2, 2 marks]

Total[14 marks]

QUESTION TWO

- a) The IQ of a sample of 1600 students was 99. Test at the 1% significance whether we can assume that this sample came from a population with mean IQ of 100 and standard deviation of 25. [6 marks]
- b) A trucking firm suspects that the average lifetime of 48 000 km claimed for certain tyres is too high. To check the claim, the firm puts 36 of these tyres on its trucks and gets a mean life of 39 478 km and a standard deviation of 2000 kms. Is this evidence that the

mean life of these tyres is in fact less than 48 000 kms? Test using the 1% level of significance.

[8 marks]

Total[14 marks]

QUESTION THREE

In a factory, four machines produce the same product. Machine A produces 10% of the output, Machine B 20%, Machine C 30% and machine D 40%. The proportion of defective items produced by these machines follows:

Machine A: 0.001

Machine B: 0.0005

Machine C: 0.005

Machine D: 0.002.

An item selected at random is found to be defective. What is the probability that the item was produced by machine:

i) A? **[5 marks]**

ii) B? **[3 marks]**

iii) C? **[3 marks]**

iv) D? **[3 marks]**

Total[14 marks]

QUESTION FOUR

a) Below is a table of values and their associated weights. If the weighted Geometric Mean for the data is 18.5, find the unknown weight, w . **[8 marks]**

Value	Weight
12	2
16	w
19	3
22	4
24	5

b) Use the appropriate method to find the average of the following index numbers:

125; 148; 160; 165; 170; 175.

[3 marks]

c) A car travels on one stretch of road at 125km/h for 50 kms, and on another stretch (full of potholes), at 40km/h for 30 kms. Find the car's overall average speed.

[3 marks]

Total[14 marks]

QUESTION FIVE

Let X be the random variable that takes on the values 1,2,3,4,5,6, when a fair die is thrown.

a) Give the probability distribution of X .

[5 marks]

b) Find the expected value of X .

[3 marks]

c) Find the variance of X .

[3 marks]

d) Find the Standard Deviation of X .

[3 marks]

Total[14 marks]

QUESTION SIX

a) A psychologist wishes to verify that a certain drug increases the reaction time to a given stimulus. The following reaction times, in tenths of a second, were recorded before and after injection of the drug for each of four subjects:

Subject	Reaction Time	
	Before	After
1	7	13
2	2	3
3	12	18
4	12	13

Test at the 5% level of significance, to determine whether the drug significantly increases reaction time.

[7 marks]

- b) The following data were collected on lost-time accidents (the figures given are mean hours lost per month over a period of 1-year) both before and after an industrial safety program was put into effect. Data were recorded for six industrial plants. Do the data provide sufficient evidence to indicate whether the safety program was effective in reducing lost-time accidents? (use $\alpha = .10$)

	Plant number					
	1	2	3	4	5	6
Before Program	38	64	42	70	58	30
After program	31	58	43	65	52	29

[8 marks]

Please turn to next page

QUESTION SEVEN

The following incomplete frequency table is constructed from a sample of the accounts receivable of a small merchandising firm.

Receivable	cf
35-39	1
40-44	3
45-49	6
50-54	10
55-59	14
60-64	22
65-69	30
70-74	36
75-79	40
80-84	45
85-89	48
90-94	50

- a) Construct a relative frequency Histogram **[3 marks]**
b) Construct a cumulative relative frequency curve and from it, estimate the Median. **[2,2 marks]**
c) Check the median in b) above by calculation. **[2 marks]**
d) Calculate the MODE. **[3 marks]**
e) Using Chebycheff's Theorem, describe the distribution. **[2 marks]**
- Total [14 marks]**

END OF EXAMINATION, GOOD LUCK