

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
BACHELOR OF COMMERCE HONOURS DEGREE
QUANTITATIVE ANALYSIS FOR BUSINESS CIN 1207
APRIL/MAY 2006 SECOND SEMESTER EXAMINATION

DURATION: 3 HOURS

INSTRUCTIONS

1. Answer Section A (question 1) completely (compulsory)
 2. Choose and answer five (5) questions from questions 2 to 7, in Section B, then answer question 8.
 3. Graph paper will be provided on request.
 4. Statistical tables will be provided on request
 5. You may use a non-programmable scientific calculator
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SECTION A: COMPULSORY

[30 marks]

QUESTION ONE

Define the terms:

- | | |
|------------------|------------------|
| a) Sample | [1 mark] |
| b) Population | [1 mark] |
| c) Random Sample | [2 marks] |

Write brief notes on:

- | | |
|---------------------------|------------------|
| d) Stratified sampling | [3 marks] |
| e) Descriptive statistics | [2 marks] |
| f) Inferential statistics | [2 marks] |

For the following data:

14	21	23	21	16
19	22	25	16	16
24	24	25	19	16
19	18	19	21	12
16	17	18	23	25
20	23	16	20	19
24	26	15	22	24
20	22	24	22	20

- g) Construct a grouped frequency distribution, and a stem and leaf plot.(use classes 12-14; 15-17; 18-20; 21-23; etcetera for the frequency distributions.

[3 marks]

[3 marks]

- (h) The average time and variance taken by 2 athletes to run a distance of 100 metres (each athlete ran the distance 10 different times) follows:

	mean	variance
Athelete 1	5 minutes	0,25 minutes ²
Athelete 2	4,5 minutes	1.6 minutes ²

- Suppose that an Athlete must be selected to participate in a competition, which athlete should we select and why?

[2 marks]

- i) An organization plots its wages using a frequency polygon and discovers that the distribution of wages is terribly skewed. Which measure of central tendency should the organization be advised to use?

[2 marks]

- j) A man travels to his rural home 100 km away. He boards a bus, which travels at 120km/hour for 58 km, then hitch-hikes in a BMW which travels at 200km/hour for the rest of the journey. Find his overall average speed for the entire journey.

[4 marks]

- k) The rate of inflation in country X over a five year period was; 4%; 5%; 3%; 6%; 2%.
What is the average rate of inflation in country X over the five year period?

[3 marks]

- k) What is the variance of the Binomial probability distribution?

[1 mark]

- l) What is the expected value of a Poisson probability distribution?

[1 mark]

**SECTION B: CHOOSE AND ANSWER ONLY FIVE(5) QUESTIONS
OUT OF SIX(6) QUESTIONS, THEN ANSWER THE COMPULSORY
QUESTION NUMBER 8.**

[70 MARKS]

QUESTION TWO

- a) The demand for a product of Express Stores varies greatly from month to month.
The probability distribution in the following table, based on the past two Years of data, shows the company's monthly demand.

Unit Demand	Probability
300	.20
400	.30
500	.35
600	.15

If the company bases monthly orders on the expected value of the monthly demand, what should Express's monthly order quantity be for this product?

[3 marks]

- b) Consider the purchase decisions of the next three customers who enter the Edgars Store. On the basis of past experience, the store manager estimates the probability that any one customer will make a purchase to be 0.30. What is the probability that two(2) of the next three(3) customers will make a purchase?
[3 marks]
- c) What is the probability that the first of the next three (3) customers will make a purchase?
[2 marks]
- d) What is the probability that none of the next three (3) customers make a purchase?
[2 marks]
- Total [10 marks]**

QUESTION THREE

Suppose this is a DUNLOP TYRE PROBLEM. Given that Dunlop has just developed a new steel-belted radial tyre that will be sold through a national chain of discount stores. Because the tyre is a new product, Dunlop's managers believe that the mileage guarantee offered with the tyre will be an important factor in the acceptance of the product. Before finalizing the tyre mileage guarantee policy, Dunlop's managers want probability information about the number of miles x , the tyres will last. From actual road tests with the tyres, Dunlop's engineering group has estimated that the mean tyre mileage is $\mu=36\ 500$ km and that the standard deviation is $\sigma= 5000$. In addition, the data collected indicate that a normal distribution is a reasonable assumption.

- a) What percentage of tyres is expected to last more than 40 000 Km?
[5 marks]
- b) Suppose that Dunlop is considering a guarantee that will provide a discount on replacement tyres, if the original tyres do not provide the guaranteed mileage. What should the guarantee mileage be if Dunlop wants no more than 10% of The tyres to be eligible for the discount guarantee?

[5 marks]

Total [10 marks]

QUESTION FOUR

The City of Bulawayoo has joined a club of organizations and companies that overlook the relevance of statistics in business. A former student of Quantitative Analysis for Business (ex-student) who had just joined City Council decided to draw the authorities' attention to the fact that, while it was a fantastic idea to have an average figure for water consumption monthly, it was also essential to have knowledge of variation in the actual consumption from month to month. The ex-student further argued that a comparison of consumption from one month to another would have also enabled the better management of resources. For instance, he argued, a month that showed consistent water consumption might require less resources and the rest of the resources could be channeled elsewhere to benefit ratepayers. This view stems from the position that if there is greater variation in consumption, relatively, then there is instability that requires closer monitoring, hence greater resources.

Therefore budget allocation for water delivery must reflect this. Using random samples of Industrial consumers, in July and August 2005, the ex-student collected the following data.

Table showing water consumption by a random sample of 144 Industrial consumers in July and 196 in August 2005.

Consumption (Kilo liters)	July	August
10-<20	8	4
20-<30	19	18
30-<40	38	39
40-<50	40	69
50-<60	22	41
60-<70	13	20
70-<80	4	5

If ex-student's theory works, which month then should receive more attention, hence more resources? **[10 marks]**

QUESTION FIVE

Twenty-eight applicants interested in working for a social welfare program took an examination designed to measure their aptitude for social work. The following test scores were obtained:

79	97	86	76
93	87	98	68
84	88	81	91
86	87	70	94
77	92	66	85
63	68	98	88
46	72	59	79

- Construct a relative frequency histogram for the test scores.(use an interval width of 10, starting at 44,5)
- What proportion of scores are less than 80,5?
- What proportion of scores are below the modal score? **[10 marks]**

QUESTION SIX

An experiment was planned to compare the mean time (in days) required to recover from a common cold for persons given a daily dose of 4 grams of vitamin C versus those who were not given a vitamin supplement. Suppose that 35 adults were randomly selected for each treatment category and that the mean recovery times and standard deviations for the two groups were as follows:

Treatment		
	No Vitamin	4 mg Vitamin C
Sample size	35	35
Sample mean	6,9	5,8
Sample Standard Deviation	2,9	1,8
Population mean	μ_1	μ_2

Suppose your research objective is to show that the use of Vitamin C reduces the mean time required to recover from a common cold and its complications.

- a) Determine the Null and alternative hypothesis, and conduct an appropriate hypothesis test at the 5% level of significance.
- b) Repeat the test using *p-values*. **[10 marks]**

QUESTION SEVEN

To compare the demand for two different dishes, the manager of a cafeteria recorded the number of purchases for each dish on seven consecutive days before an advert on television, and after. The data are shown in the following table:

Day	A	B
Monday	420	391
Tuesday	374	343
Wednesday	434	469
Thursday	395	412
Friday	637	538
Saturday	594	521
Sunday	679	625

At the 5% level of significance, do the data provide sufficient evidence to indicate a greater demand for dish **B**, than for dish **A**. Carry out an appropriate Hypothesis test using σ of 1%.

[10 marks]

QUESTION EIGHT (COMPULSORY)

The typical household income (Million dollars) for a sample of 20 cities, towns and growth points follow:

City/Town/Growth Point	Income
Kariba	74.1
Victoria Falls	82.4
Hwange	71.2
West Nicholson	62.8
Kadoma	79.2
Chegutu	66.8
Harare	132.3
Zvishavane	82.6
Beitbridge	85.3
Masvingo	75.8
Mutare	89.1
Gwanda	75.2
Tsholotsho	78.8
Kwekwe	100.0
Plumtree	77.3
Gokwe	87.0
Marondera	67.8
Gweru	71.2
Bulawayo	106.4
Mutare	97.4

- a) Compute the mean and standard deviation for the data.
- b) Using the mean and standard deviation computed in a) above as estimate of the mean and standard deviation of household income for the population of all cities, use Chebychev's theorem to determine the range within which 75% of the household incomes for the population of all cities must lie.

[20 Marks]

*****END OF EXAMINATION, GOOD LUCK*****