

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
BACHELOR OF COMMERCE(HONS)DEGREE

QUANTITATIVE ANALYSIS FOR BUSINESS CIN 1207

SPECIAL SUPPLEMENTARY EXAMINATION OCTOBER DURATION: 3
HOURS

INSTRUCTIONS TO CANDIDATES

1. Answer ALL questions in Section A
2. Choose and answer **five(5)** questions only in Section B
3. Graph paper will be provided
4. Statistical tables will be provided
5. You may use a non-programmable scientific calculator

SECTION A(ANSWER ALL QUESTIONS) [40 MARKS]

QUESTION 1

- a) A Toxicologist is interested in the effect of pollution control efforts. Eight companies are chosen at random. The amount of a particular pollutant is reported for each company in 1991 and again reported for the same company in 1992. What sort of hypothesis test should we conduct?

(2 marks)
- a) A foreman is concerned about the amount of time that workers spend in the rest-room. A random sample of 12 workers in one day gave the following times in minutes:
3;5;4;3;2;4;4;1;3;3;5;5. Give the 95% prediction interval.

(4marks)
- b) Eight department store shoppers are surveyed to identify the average amount that a shopper spends in a single store visit and the following are the results:
185;365;458;27;1250;240;580;295 Dollars. Give the 99% confidence estimate of the population average amount spent by shoppers in the Departmental Store.

(4marks)
- c) 400 zippers are inspected and 74 are found to be defective. Give the 95% confidence interval estimate of the population proportion of defective zippers.

(4marks)
- d) What is the effect on the standard error of the mean, of quadrupling the sample size ?

(4 marks)

You are the boss and your employees salaries are \$ 56 535; \$ 47 648; \$43 555; \$ 46 062; \$ 41 941; \$ 28 436; \$ 64 274; \$ 40 566; \$ 55 957; \$ 40 413; \$ 52 016.

Test using the confidence interval method, whether your employees' salaries are significantly different from the industry mean of \$ 37 000.

(10 marks)

e) In a sample of 250 men, 200 were cigarette smokers. Determine:

i) the 95%

(3 marks)

ii) the 99% confidence Interval for the proportion of all male smokers

f) A sample of 150 light bulbs of type A gave a mean life of 1400 hours and a standard

deviation of 120 hours. Another sample of 200 light bulbs of type B gave a mean life of 1200 hours and a standard deviation of 80 hours.

Determine a 95% confidence interval for the difference between the mean life spans of the two types of light bulbs.

(5 marks)

h) Out of 2500 smokers, 218 expressed that they preferred your Company's brand of cigarette.

Construct a 95% confidence interval of the population proportion of smokers who prefer your Company's brand of cigarette.

(4 marks)

Total[40 marks)

SECTION B: CHOOSE AND ANSWER 5 QUESTIONS ONLY OUT OF 7

QUESTION 2

a) The following table shows the "before and after use" of smokeless tobacco for the non-user group.

(Heart rates before and after using smokeless tobacco for the non-user group)

Subject	Heart-rate before	Heart-rate after
1.	81	105
2.	81	91
3.	68	87
4.	61	86
5.	67	82
6.	74	78
7.	75	87
8.	64	94
9.	70	93
10.	60	90

Does tobacco usage cause an increase in the heart-rate of the non-user? Test using $\alpha = 5\%$

(10 marks)

b) A survey of 400 respondents produced the following cell-counts:

Rows	-----			Total
	1	2	3	
1	37	34	93	164
2	66	57	113	236
Total	103	91	206	400

Test the Hypothesis that the probability that a response falls in any one row is independent of the column it will fall. Use $\alpha = 5\%$.

(10 marks)

Total[20 marks]

QUESTION 3

- a) 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 supplement	4g Vitamin C
Sample size	35	35
Sample mean	6,9	5,8
Sample standard Deviation	2,9	1,2
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, set up the appropriate Hypotheses and carry out a suitable test using the 5% significance level.

(10 marks)

- b) Independent random samples of $n_1 = 12$ and $n_2 = 16$ observations were selected from 2 normal populations with equal variances. The sample means and variances are shown below:

Population		
	1	2

Sample size	12	16
Sample mean	34,7	32,1
Sample variance	4,9	6,1

- i) Suppose you wish to detect the difference between the population means, state the Null and Alternative Hypothesis for the test.
- ii) Find the rejection region for the test, with $\alpha = 10\%$.
- iii) Find the value of the test statistic.
- iv) Conduct the test and state your conclusions

(10 marks)

Total[20 marks]

QUESTION 4

- a) The annual production costs and the number of units produced of 10 different manufacturers were obtained. The production costs Y , (in \$ 1000) and the units produced X (1000 units) are given in the following table:

X	40	42	48	55	65	79	88	100	120	140
Y	150	140	160	170	150	162	185	165	190	185

- a) Construct the appropriate scatter diagram and comment on what you observe
(5 marks)
- b) Compute the Least Squares Regression Equation
(8 marks)
- c) Predict the Cost associated with the production of 160('000 units)
(2 marks)
- d) Interpret the regression co-efficient
(2 marks)
- e) Compute the product-moment correlation co-efficient and interpret it.

(3 marks)

Total[20 marks]

QUESTION 5

a) In a certain company after long years of experience, the following information is known about 'debtor' accounts. Accounts have a mean value of \$ 2 500 and a standard deviation of \$ 300. With regard to collection on time, 5% of the accounts can be classified as 'doubtful'. Stating any assumptions you may make, answer the following questions:

i) If an account is randomly selected, what is the probability that its value will be between \$ 2 600 and \$ 2 850?

(5 marks)

ii) If 5 accounts are randomly selected, what is the probability that there would be exactly 2 doubtful accounts?

(2 marks)

iii) One(1) account is randomly selected and it is learnt that its value is less than a certain amount with a 0,12 probability. What is that specific amount?

(5 marks)

b) Among the products of a certain company are beadings of mean length 80cm and standard deviation 2cm. The production process is estimated to produce 10% 'misshaped' beadings. It is specified also, that the average number of knots per 100cm of beading is 1,5. Stating carefully any assumptions you might make, answer the following questions:

i) If one(1) beading is selected at random, what is the chance that its length is between 83cm and 85 cm?

(2 marks)

ii) If a sample of 5 beadings is selected, what is the probability that there are three(3) misshapes.

(2 marks)

iii) What is the probability that one(1) beading of mean length will contain two(2) or less knots?

(2 marks)

Total[20 marks]

QUESTION 6

Construct a frequency distribution with intervals of 20 starting at 260-<280, etc, for the following data:

WEEKLY SALES OF BREAD

300 400 362 289 271 463 421 282 361
267 366 403 333 371 401 321 352 401
321 379 260 346 372 395 329 396 300
400 401 460 368 375 319 400 380 300
350 400 345 350 370 320 361 398 335

You are required to construct a “Less than Ogive” and estimate from it, the following:

- a) The arithmetic mean (2 marks)
- b) The mode (2 marks)
- c) The median (2 marks)
- d) The Lower Quartile (2 marks)
- e) The Upper Quartile (2 marks)

Verify your answers for the above by calculation

(10 marks)

Total[20 marks]

QUESTION 7

- a) Define the terms:
 - i) Type I error
(2 marks)
 - ii) Type II error
(2 marks)

- b) A trucking firm suspects that the average lifetime of 28 000 Km claimed for certain tyres is too high. To check the claim, the firm puts 40 of these tyres on its trucks and gets a mean lifetime of 27 563 Km and a standard deviation of 1348 Km. Is this evidence that the mean lifetime for these tyres is in fact less than 28 000 Km? Carry out an appropriate test using $\alpha=0,01$.

(16 marks)

Total[20 marks]

QUESTION 8

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 is as 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:

- i) the item was produced by Machine A?
(4 marks)
- ii) the item was produced by Machine B?
(4 marks)
- iii) the item was produced by Machine C?
(4 marks)
- iv) the item was produced by Machine D?
(4 marks)

Total[20 marks]

END OF EXAM