BACHELOR OF COMMERCE (HONOURS) DEGREE

QUANTITATIVE ANALYSIS FOR BUSINESS CIN 1207

SUPPLEMENTARY EXAMINATION JULY 2001   **DURATION: 3 HOURS**

INSTRUCTIONS TO CANDIDATES
1. Answer all questions in Section A
2. Choose and answer three (3) out of (5) questions in Section B
3. Answer both questions in Section C
4. Graph paper will be provided
5. Statistical tables will be provided
6. You may use a non-programmable Scientific Calculator

SECTION A (ANSWER ALL QUESTIONS)
[40 MARKS]

QUESTION ONE

a) The shopping times were recorded for n=64 randomly selected customers from a local supermarket. The average and variance of the 64 shopping times were 33 minutes and 256 minutes respectively. Estimate the true average shopping time per customer, Φ, with a 90% Level of Confidence.

[4marks]

b) A hospital wished to estimate the average number of days required for treatment of patients between the ages of 25 and 34 years. A random sample of 25 hospital patients between these ages produced a mean and standard deviation equal to 5,4 and 3,1 days, respectively. Construct the appropriate 95% confidence Interval estimate of the true population mean length of stay for the population of patients from which the sample was drawn.

[4 marks]

c) You wish to estimate the average daily yield of a chemical, Φ, and you wish the error of estimation to be less than 5 tons with a probability of 0,95. What should the sample size, *n,* be?

[5 marks]

d) A manufacturer of gun - powder has developed a new powder, which was tested in eight shells. The resulting muzzle velocities, in metres per second, were as follows:

3005	2925	2935	2965
2995	3005	2937	2905

Find a confidence Interval for the true average velocity, Φ, for shells of this type, with 95% confidence.

[10 marks]

e) The number of typing errors made by a particular typist has a Poisson distribution with an average of four (4) errors per page.

If more than 4 errors show on a given page, the typist must re-type the whole page. What is the probability a certain page does not have to be re-typed?

[6 marks]

f) Two coins are tossed once. If X equals the number of heads that turn up, what is the probability distribution of X?

[6marks]

g) Does the Probability distribution in 'f' above meet the requirements of a Probability distribution and why ?

[5 marks]

SECTION B (CHOOSE AND ANSWER ONLY 3 OUT OF 5 QUESTIONS)

QUESTION TWO

The following is sample data obtained in a study of the relationship between the number of years that applicants for certain foreign Service Jobs have studied German in high school or College and the grades which they received in a proficiency test in that language.

No. of years	3	4	4	2	5	3	4	5	3	2
Grade in Test	57	78	72	58	89	63	73	84	75	48

a) Plot the Scatter graph
b) Compute the appropriate Least Squares Regression Equation
c) Comment on the Regression Co-efficient
d) Super-impose the Least Squares Trend Line onto the Scatter graph.
e) Predict the "Grade in Test" for someone with 8 years in "School or College Studying German", using your Least Squares Equation.

[20 marks]

QUESTION THREE

a) The average IQ of a sample of 1600 students was 99. Test at the 5% Significance Level, whether we can assume   that this sample came from a population with a mean IQ of 100 and standard deviation of 15.

b) A manufacturer claims that his light bulbs have an average life of 1600 hours. A sample of 100 light bulbs tested gave an average of 1570 hours and a standard deviation of 120 hours. Test at the 1% significance level if his claim is true.

[20 marks]

QUESTION FOUR

a) 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 563Km and a standard deviation of 1 348 Km. Is this evidence that the mean lifetime for these tyres is in fact less than 28 000 Km? Carry out an appropriate test (use $\forall=0,01$)

b) Define Type I and Type II errors

[20 marks]

QUESTION FIVE

a) Define the terms:
i) Confidence Level
ii) Confidence Interval

b) Suppose we wish to test on the basis of a random sample of size n=5, whether the fat content of a certain kind of processed meat exceeds 30%. What can we conclude at the 0,01 level of significance, if the sample values are:

31,9; 30,3; 32,1; 31,7; and 30,9%?

[20 marks]

QUESTION SIX

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:
   a) the item was produced by Machine A?
   b) the item was produced by Machine B?
   c) the item was produced by Machine C?
   d) the item was produced by Machine D?   [20 marks]

SECTION C (COMPULSORY)
[40 MARKS]

a) A Vice-President in charge of sales for a large Corporation claims that salesmen are averaging no more than 15 sales contacts per week. (She would

like to increase this figure.) As a check on her claim, n=36 salesmen are selected at random and the number of contacts is recorded for a single randomly selected week. The sample reveals a mean of 17 contacts and a variance of 9. Does the evidence contradict the Vice President's claim?

(Test using $\forall = 0,5$)

b) A psychological study was conducted to compare the reaction times of men and women to a certain stimulus. Independent random samples of 50 men and 50 women were employed in the experiment. The results are shown in the table below:

MEN	WOMEN
$n_1 = 50$	$n_2 = 50$
$mean_1 = 42$	$mean_2 = 38$
$s_1^2 = 18$	$s_2^2 = 14$

At the 5% level of significance, is there a significant difference between the reaction times of men and those of women?   [20 marks]

QUESTION EIGHT

A die was rolled 600 times, with the following results. Do these data present sufficient evidence to indicate that the die was unbalanced? Test with $\forall = 0,05$

OBSERVED NUMBER	FREQUENCY
1	89
2	113
3	98
4	104
5	117
6	79

c) A survey was conducted to evaluate the effectiveness of a new flu vaccine that had been administered in a small community. The vaccine was provided free of charge in a two- shot sequence over a period of two weeks to those wishing to avail themselves of it. Some people received the two-shot sequence, some appeared only for the first shot and others received neither. A survey of 1000 local inhabitants in the following spring provided the information shown in the table that follows: Do the data present sufficient evidence to indicate a dependence between vaccine classification and occurrence or non-occurrence of flu?

TABLE

	No Vaccine	One shot	Two shots	**Total**
Flu	24	9	13	**46**
No Flu	289	100	565	**954**
Total	**313**	**109**	**578**	**1000**

[20 marks]

END OF EXAMINATION