NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
BACHELOR OF COMMERCE HONOURS DEGREE
QUANTITATIVE ANALYSIS FOR BUSINESS-CIN 1207
JULY 2006 SUPPLEMENTARY EXAMINATION

DURATION: 3 HOURS

INSTRUCTIONS TO CANDIDATES

1. Answer all questions in Section A
2. Choose and answer five (5) questions, from question 2 to 7, then Question eight 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) [30 MARKS]

QUESTION ONE

a) An analysis of the vitamin C content of a random sample of 75 school lunches produced a sample mean equal to 10,6 milligrams and standard deviation equal to 6,1 milligrams. Find a 90% confidence interval for the mean amount of Vitamin C contained in one of the school's lunches. Interpret the interval. **(3marks)**

b) The mean weight of a consignment of 1000 bags of maize is 45 Kg and the standard deviation is 20Kg. Assuming that weights are normally distributed, Find how many sacks weigh:

i) More than 90 Kg **(2 marks)**

ii) What weight is exceeded by 70% of the bags? (**4 marks)**

iii). What weight is exceeded by 20% of the bags? **(4 marks)**

c) Components made by a certain process have a thickness which is normally distributed about a mean of 6cm and a standard deviation of 0,06cm. A component is classified as defective if its thickness lies outside the range 5,95cm to 6,05cm.

i) What is the proportion of defective components?

(2 marks)

ii) Find the change in the proportion of defective components if the mean thickness is increased to 6,02cm, the variability remaining the same.

(3 marks)

d) A fair die is rolled once. What is the probability that it turns in a value which is at least 2? **(2 marks)**

e) From a well-shuffled pack of playing cards, a card is drawn. What is the probability that it is:

i) An Ace or a Heart? **(1 mark**)
ii) An Ace or a Black card? **(2marks)**

f) How many possible outcomes are there when a fair coin is tossed 16 times? **(2 marks)**

f) A cyclist travels at 50Km/h over a 15 Km stretch of road, and 30 Km/h over another 15 Km stretch. Find the cyclists overall average speed over the 30 Km distance. **(2 marks)**

h) Mr. David Ntelela, who operates a telephone message service gets calls that can be described by a Poisson process. The average rate at which calls come in is 4 calls per minute. Calculate the probability that during a given minute he will receive:

i) Exactly 5 calls **(1 marks)**
ii) at least 2 calls **(2 marks)**

SECTION B: CHOOSE AND ANSWER ONLY FIVE(5) QUESTIONS, THEN ANSWER QUESTION EIGHT

QUESTION TWO

a)Define the random variable ,X, to be the number of dots that are uppermost when a fair die is rolled once, and U=2X, as shown below:

X	1	2	3	4	5	6
U=2X	2	4	6	8	10	12

i) Show that E(U) = 2E(X) **(6 marks)**

ii) State the conditions that must be satisfied by a proper probability distribution function. **(4 marks)**

Total [10 marks]

QUESTION THREE

a) A drug manufacturer wishes to control, statistically, the production of an antibiotic by taking samples periodically, to compute an interval estimate of the process mean. It is especially important that accurate estimates of the mean, $\boldsymbol{\mu}$, be made, for if there is a substantial shift in the process, the drugs may be hazardous for human consumption. It is known from production records that $\boldsymbol{\sigma = 10}$ milligrams. If the maximum allowable error is two (2) milligrams and the level of confidence is specified as 99%, compute the desired sample size, $\boldsymbol{n}$. **(3 marks)**

b) You have to buy light bulbs from a manufacturer who claims that the life-time of his bulbs is 1600 hours. You would be worried only if such average life-time were less than the claimed value. You take and test a sample of 100 light bulbs , which give a mean life of 1570 hours and a standard deviation of 120 hours. Test if his claim is true at the 5% significance level. **(7 marks)**

Total [10 marks]

QUESTION FOUR

Some fish types are very difficult to distinguish, except by weight of the fish. In particular, two fishermen, were heard to argue that, two type of fish (slightly bigger than capenta fish) found in the opposite sides of a lake were significantly different. The following statistics are available concerning the fish:

	Sample 1	**Sample 2**
Mean	250g	253g
Standard Dev.	10g	15g
Sample size, n.	36	40

Is there evidence from this sample, that the mean for population 2, i.e. $\mu_{2,}$ is significantly different from the mean for population 1, $\mu_{1.}$ Test at the 5% level of significance. Are the fish likely to be from the same species, or not?

Total [10 marks]

QUESTION FIVE

The following is a table of distances recorded by 2 teams of salesmen, A and B, over a period of time

Dist (Km)	f_A	f_B
Under 100	3	4
100-<120	4	5
120-<140	4	6
140-<160	12	9
160-<180	15	13
180-<200	15	15
200-<220	27	23
220-<240	27	25
240-<260	22	24
260-<280	21	20
280-<300	17	19
300-<320	12	18
320-<340	17	16
340and over	7	8

Determine:

i) Which team has recorded more distance, overall, between A & B.

(3 marks)

ii) Which team is more consistent between A & B and how do you know?

(7 marks)

Total [10 marks]

QUESTION SIX

a) It is known from experience that in a certain industry 60% of all labor-management disputes are over wages, 15% are over working conditions and 25% are over fringe benefits. Also, 45% of the disputes over wages are resolved without strikes, 70% of the disputes over working conditions are resolved without strikes and 40% of the disputes over fringe benefits issues are resolved without strikes. What is the probability that a labour –management dispute in this industry will be resolved without a strike?

Total [10 marks]

QUESTION SEVEN

A consignment of items is found to be 10% defective. For a random sample of 5 items selected from this consignment, what is the probability distribution of X, where X is the number of defective items in the consignment?

Total [10 marks]

QUESTION EIGHT (COMPULSORY)

The life times of batteries of a certain type produced by a company are normally distributed with an average of 29 months and standard deviation of 4.

a)

i) What proportion of batteries will have a lifetime exceeding 24 months?

(1 mark)

ii) What proportion of batteries will fail before they have been in service for 24 months

(1 mark)

iii) What proportion of the batteries will last between 20 and 36 months?

(2 marks)

iv) What proportion of the batteries will last more than 25 months?

(2 marks)

v) What lifetime, X, is exceeded by 90% of the batteries?

(2 marks)

vi) Five (5) percent of the batteries will have a lifetime exceeding how many months?

(2 marks)

b) In a Quantitative Analysis for Business exam, 40% of the candidates scored above 60 and 35% scored below 40. If examination marks for this course are approximately normally distributed, find the mean and standard deviation for the distribution of marks.

(10 marks)
Total [20 marks]

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