

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

**QUANTITATIVE ANALYSIS FOR BUSINESS CIN 1207**

**JUNE 2004 SECOND SEMESTER EXAMINATION**

**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) State the Central Limit Theorem. **[3 marks]**
- b) Use diagrams to illustrate the concept of Skewness. **[6 marks]**
- c) Assume 2 characteristics (random variables) are being studied, namely, **turnover and employee Age**. Determine which characteristic shows greater variability.

	<b>Turnover/month</b>	<b>Employee Age</b>
Mean	\$54 588	38,2 yrs
Standard deviation	\$ 8 444	7,9 yrs

**[3 marks]**

- d) A cyclist travels 50km/hour over a 5km stretch of road, and 30km/hour over another hilly 5km stretch of road. Find the cyclist's average speed over the 10km distance. **[2 marks]**
- e) A training consultant is paid \$150 per hour for one 8 hour training program; \$120 per hour on a second training program for 6 hours and \$200 for a 2 hour seminar. What are his average earnings per hour for the three engagements combined? **[2 marks]**
- f) In the OK Grand Challenge, the winner must pick 6 horses out of 18 and arrange them correctly, in the order 1 to 6. In how many ways can this be done? **[2 marks]**
- g) A company has 12 products in its product range. It wishes to advertise in the local newspaper, but due to space constraints, it is only allowed to display 7 of its products at a time. How many different ways can this company compose a display in the local newspaper? **[2 marks]**

- h) Section B of a QAB Exam comprises 7 questions and a candidate is required to choose and answer 5. How many choices does the candidate have? **[2 marks]**
- i) Write 4 important points about each of the following: (4 lines each)
- i) Simple Random Sampling **[2 marks]**  
 ii) Stratified Sampling **[2 marks]**
- j) From a sample of 64 Luveve car commuters, the sample mean time to commute to work daily was found to be 26,5 minutes. If the population standard deviation is known to be 15 minutes, find the 95% confidence interval estimate of the actual mean time,  $\mu$ , taken by all car commuters in Luveve. **[4 marks]**
- k) If the sample size in (j) above were 25 and the mean and standard deviation remaining the same, compute a 99% confidence interval estimate of the population mean,  $\mu$ . **[4 marks]**
- l) Mr Thubelihle, 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 5 calls per minute. Calculate the probability that he will receive:
- (i) Exactly 6 calls during a given minute. **[2 marks]**  
 (ii) At least 2 calls during a given minute. **[4 marks]**
- [Total 40 marks]**

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

**QUESTION 2**

- a) From the following table of orders received;

Value of order (\$ 00)	Number of orders	Number of orders
	Received (Week 1)	(Week 2)
0- <5	20	100
5- <10	51	115
10-<15	139	65
15-<20	116	40
20-<25	31	50
25-<30	14	10
30-and above	5	2

Calculate the following:

- (i) co-efficient of variation week 1 **[9 marks]**  
 (ii) Co-efficient of variation week 2 **[9 marks]**

(iii) Which week shows greater variability in orders received and why?

[2 marks]

[Total 20 marks]

### **QUESTION 3**

David Ntelela, president of a savings and loan association, claims that too much emphasis is placed on the amount of money each client has on deposit. Equally important is the length of time the money remains on deposit. She designed an Index that multiplies the amount of money on deposit by the time on deposit, with adjustments made for additional deposits or withdrawals. She then introduced a premium incentive plan designed to discourage withdrawals. She randomly selected 15 accounts and compared the index scores before and after introducing the plan. The results were as follows:

Account	After	Before
1.	10 500	10 020
2.	780	720
3.	9 453	9 105
4.	1 573	1 062
5.	3 962	3 905
6.	4 673	4 401
7.	8 205	8 100
8.	12 458	12 011
9.	959	847
10.	7 444	6 853
11.	4 982	4 602
12.	8 831	8 452
13.	648	182
14.	6 969	6 740
15.	2 403	2 378

i) should a directional or non-directional hypothesis be used in assessing her claim? [2 marks]

ii) What is the appropriate statistical test? [2 marks]

iii) Using  $\alpha=0,01$  , evaluate her claim. [16 marks]

[Total 20 marks]

### **QUESTION 4**

a) A wine dealer has classified the last 200 customers according to criteria given in the following table:

Type of wine bought	Age of customer			Total
	Under 30	30 to <50	50+	
Zimbabwean	100	30	20	150
French	2	2	16	20
German	2	16	2	20
Other	4	6	0	10
Total	108	54	38	200

Find the following probabilities:

- i) P(Customer being of age less than 30) **(1 mark)**
- ii) P(Zimbabwean) **(1 mark)**
- iii) P(Zimbabwean or French) **(2 marks)**
- iv) P(age being less than 30 and Zimbabwean) **(2 marks)**
- v) P(age 30 or Zimbabwean) **(2 marks)**
- vi) P(age 50 + given French) **(2 marks)**

(b) What are the features of the Binomial probability distribution? **(4 marks)**

(c) Once per week a merchandiser replenishes the stocks of a particular product brand in Store for which she is responsible. Experience has shown that there is one in five chance that a given store will have run out of stock before the merchandiser's weekly visit..

What is the probability that, on a given weekly round, the merchandiser will find:

- i) Exactly 1 store is out of stock? **[2 marks]**
  - ii) Less than 2 stores are out of stock? **[2 marks]**
  - ii) More than 2 stores are out of stock? **[2 marks]**
- [Total 20 marks]**

### **QUESTION 5**

- a) In any recession, companies may cut or omit dividends, but usually as a last resort. In fact, some companies may maintain dividends as an outward sign of good health. A survey by Standard & Poor compared the percentage of companies that cut or omitted dividends during the first 9 months of 1980 to the percentage for a similar period in 1975. Based on 1 537 companies in 1975 it was observed that 24,14 percent decreased or omitted dividends; whereas in 1980, of 2026 companies. 9,62 percent did likewise. Is there a significant difference between 1975 and 1980 with respect to slashing of dividends?
- b) When exploring for oil in many geologically promising offshore sites, three exploratory wells were drilled at a cost of about \$ 6 million each(1990. Past experience has shown that the probability is about 0,20 that a given hole will yield sufficient indications of oil to justify further exploration of a potential field. It has been hypothesized that the number of promising wells at a given

test site follows a binomial distribution with  $p=0,20$ . Let us suppose that at 640 test sites, 320 found no oil whatsoever, 523 found one promising wells. Do the observed results fit a binomial model? Carry out the appropriate test, at  $\alpha=0,05$ .

### **QUESTION 6**

You wish to stand at a Point on the highway between Norton and Harare to distribute fliers containing information on a product your company wishes to launch. You decide you need to have some knowledge of the total time it would take approximately 99% of the Norton motorists who commute to Harare daily, to pass your selected point on the highway. A random sample of 60 cars yield the following times , in minutes:

30 28 58 20 25 28 29 32 27 22  
 32 34 31 35 34 26 24 21 33 34  
 33 44 41 40 42 41 45 46 47 43  
 31 50 43 48 49 51 46 49 39 38  
 27 23 52 54 55 34 44 55 51 53  
 28 33 34 36 30 29 54 60 57 40

Required:

- i) construct a Frequency Distribution table starting at 20-22; 23-25; 26-28 etc **[4 marks]**
- ii) use Chebychev's Theorem to describe the distribution. **[4 marks]**
- iii) Use Pearson's 2<sup>nd</sup> Coefficient of Skewness to check for the direction of Skew, if any, in the above distribution and comment on Sk. **[6 marks]**
- iv) Given your solution to iii) which measure of Central Tendency would be appropriate to use for this distribution and why? **[6 marks]**

**Total[20 marks]**

### **QUESTION 7**

- a) Landlords have been concerned about accepting tenants who own waterbeds, even though the tenant may meet all usual standards of acceptability. Mr Biya Bambazonke is the owner of an older apartment house that fails to meet many present-day building codes. A prospective tenant satisfies all of the usual standards of acceptability except that he owns a waterbed. The Landlord fears that the weight of a waterbed will cause the floor to collapse. The possibility of spending endless days in court defending himself against lawsuits is not an appealing prospect. However, before making the decision, Thomas seeks out data. On researching the question, he learns that a king-size waterbed without pedestals, when filled with 235 gallons of water, exerts a pressure of 48,29 Kgs per square metre. However, the amount of water used to fill the mattress is quite variable. Consequently, the pressure is Normally distributed about a mean of 48,29 with a standard deviation of 4,21. Structural engineers have told Thomas that the floors of his apartments can safely withstand a pressure

of 59Kgs per square metre. What is the probability that a given king-size waterbed, when filled, will equal or exceed this limit? **[10 marks]**

- b) There are many occasions when statistical analysis is used as the basis for establishing business, financial, or production goals. For example, automobile manufacturers are presently engaged in a competitive race to produce cars with high mileage ratings. The city miles-per-gallon ratings of compact cars are Normally distributed with a mean of 25.49 and a standard deviation of 2.36. An Automobile manufacturer wants to design a car so that its mileage ratings are better than 99% of compact cars presently on the road. What mileage rating should the manufacturer establish as a production goal?

**[10 marks]**

**Total[20 marks]**

### **QUESTION 8**

- a) A luxury passenger liner has 500 passengers on board whose ages are Normally Distributed with a mean of 60 years and a standard deviation of 12 years. How many of the passengers are:

i) between 45 and 78 years old? **[2 marks]**

ii) Older than 78 years old? **[2 marks]**

iii) Younger than 45 years? **[2 marks]**

iv) What is the minimum age of the oldest 20% of the passengers?

**[5 marks]**

- b) In an exam, 45% of the candidates scored above 60, and 25% below 40. If marks are approximately Normally distributed, find the estimate mean,  $\mu$ , and the standard deviation,  $\sigma$ , for this distribution.0 **[9 marks]**

**[Total 20 marks]**

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**END OF EXAMINATION PAPER**