

**INSTITUTE OF BANKERS IN MALAWI**

**DIPLOMA IN BANKING EXAMINATION**

**SUBJECT: INTRODUCTION TO BUSINESS STATISTICS**

**(IOBM – D212)**

**Date: Thursday, 8th November 2012**

**Time Allocated: 3 hours (08:00 – 11:00 am)**

**INSTRUCTIONS TO CANDIDATES**

1 This paper consists of **TWO** Sections, A and B.

2 Section A consists of multiple choice questions, each question carries 3 marks. Answer **ALL** questions.

3 Section B consists of 4 questions, each question carries 20 marks. Answer **ANY TWO** questions.

4 You will be allowed **10 minutes** to go through the paper before the start of the examination, you may write on this paper but not in the answer book.

5 Begin each answer on a new page.

6 **Please write your examination number on each answer book used. Answer sheets without examination numbers will not be marked.**

7 DO NOT open this question paper until instructed to do so.

**SECTION A (60 MARKS)**

**Answer all questions from this section.**

**For items 1), 2),** and **3):** Let** be a standard normal variable. Then

1. **is
2. 0.2514 **c.** 0.2486
3. 0.7486 **d.** -0.2514
4. ** is
5. 0.3208 **c.** 0.8100
6. 0.1820 **d.** 0.6792
7. ** is
8. 0.3208 **c.** 0.2486
9. 0.1820 **d.**  0.6792

**Items 4)** and **5):** A survey asked bank employees how often they exceed the speed limit when driving to or from work. The responses are summarised below.

|  |  |  |  |
| --- | --- | --- | --- |
| **Age** | **Always** | **Not Always** | **Total** |
| **Under 30** | 100 | 100 | 200 |
| **Over 30** | 40 | 160 | 200 |

1. Among the employees aged *‘over 30’,* what is the ‘likelihood’ of always exceeding the speed limit?
   1. 0.20 **c.** 0.62
   2. 0.35 **d.** 0.50
2. What is the probability that a randomly selected employee is *‘over 30’* given that the employee does not always exceed the speed limit?
   1. 0.20 **c.** 0.62
   2. 0.35 **d.** 0.50
3. The ratio of a new price to the base year’s price is the
   1. price absolute **c.** price increase
   2. price relative **d.** price decrease
4. Which of the following statements are true for Laspeyres’ price index?
5. Requires quantity data from the base period only.
6. Requires quantity data for each year
7. It may overweight goods whose prices increase.
8. Does not reflect changes in buying over time.
9. **I**, **II** and **III**
10. **I**, **II** and **IV**
11. **I**, **III** and **IV**
12. **II**, **III** and **IV**
13. A normal distribution is
    1. symmetric around the mean
    2. bell shaped
    3. asymptotic to the X-axis.
    4. All of the above
14. If we use z scores to convert any normal distribution, the new distribution is
    1. a binomial distribution with mean of 0 and standard deviation **
    2. a standard normal distribution with mean of 0 and standard deviation of 1
    3. a standard normal distribution with mean ** and variance **
    4. a Poisson distribution with mean 0.
15. To apply the rule , the events must be
    1. joint events **c.** mutually exclusive events
    2. conditional events **d.** independent events
16. In a 1-tailed test using z-test statistic and 0.01 significance level, the critical value is either
    1. -1.96 or +1.96 **c.** -2.58 or +2.58
    2. -1.65 or +1.65 **d.** None of these is correct
17. A type II error is committed when
    1. a false null hypothesis is accepted
    2. a true null hypothesis is rejected
    3. a true alternative hypothesis is accepted
    4. both the null and alternative hypotheses are accepted at the same time
18. The test statistic ** was calculated in a 1-tailed test with the critical/rejection region in the lower tail. At 0.01 significance level this indicates
    1. ** should be accepted
    2. ** should be rejected in favour of **
    3. the 0.05 level of significance should have been used
    4. the 2-tailed test should have been used
19. Suppose you want to carry out a hypothesis test to confirm whether two population means are the same. Then the null and alternative hypotheses would be stated as
    1. **
    2. **
    3. **
    4. **
20. Which of the following mathematical relationships could be used in a linear programming model?
21. **
22. **
23. **
24. **
25. **I** only **c. II** only
26. **I** and **IV** **d. II** and **III**
27. Consider the following linear program whose optimal point is (2,4):

Max: **

s.t. ** **

**

**

**

The value of the objective function at the optimal solution is

* 1. 6 **c.** 10
  2. 8 **d.** 12

**For items 17)** and **18)**: Suppose you invest K80,000.00 in a fixed deposit account with a bank for 3 years at a rate of 7% per annum.

1. How much would you receive upon maturity of the account if interest is compounded annually?
   1. K64,348.56 **c.** K81,408.18
   2. K98,003.44 **d.** K98,634.05
2. How much would you receive upon maturity of the account if interest is compounded monthly?
   1. K913,915.38 **c.** K81,408.18
   2. K98,003.44 **d.** K98,634.18
3. The term Internal Rate of Return (IRR) refers to
   1. the rate at which a project recoups its initial cost out of the cash receipts it generates
   2. the ratio of average annual return or profit to initial cost of an investment.
   3. the discount rate which yields a net present value of zero
   4. the rate at which the future value is equal to the present value
4. Which of the following is not a property of a chi-squared distribution?
   1. Value are never negative
   2. The shape does not depend on the size of the sample
   3. Distribution is positively skewed
   4. Its bell shaped
5. A chi-squared test involves a set of counts called ‘expected frequencies’. Expected frequencies are
   1. hypothetical counts that would occur if the alternative hypothesis were true
   2. hypothetical counts that would occur if the null hypothesis were true
   3. actual counts that occurred in a data set
   4. theoretical counts that would occur if the degree of freedom were increased
6. The degree of freedom for a chi-squared test involving a contingency table with 6 rows and 3 columns.
   1. 18 **c.** 12
   2. 15 **d.** 10
7. In a chi-squared goodness-of-fit test with 10 categories, the critical value at 0.05 significance level is
   1. 16.919 **c.** 15.987
   2. 18.307 **d.** 14.684
8. Suppose that a chi-squared test statistic for chi-squared goodness-of-fit test is found to be **. Then
   1. the *p*-value is 1.0
   2. the expected and observed frequencies for each category are the same
   3. the null hypothesis is not rejected
   4. all the above are true

**For items 25),** and **30):** A survey asked drivers in Blantyre to indicate their preferred petrol service station. The results are summarized below:

|  |  |
| --- | --- |
| **Service station preferred** | **Number of drivers** |
| **Puma** | 118 |
| **Engen** | 95 |
| **Total** | 102 |
| **Petroda** | 135 |

1. To test the claim that preference for service station is uniform, the null hypothesis would be stated as follows:
2. The level of preference for the service stations is the same for each service station
3. More drivers in Blantyre prefer Petroda service station
4. The level of preference is not the same among the service stations
5. There is a difference between observed and expected sets of frequencies.
6. The critical value (to 1 dec. place) at 0.05 level of significance for the data is
7. 9.5 **c.** 17.7
8. 9.4 **d.** 7.8
9. The expected frequencies for the services stations are
10. 118; 95; 102; 135
11. 112.5 each
12. 450 each
13. 150 each
14. The value of the chi-squared test statistic is
15. 8.47 **c.** 0
16. 43.85 **d.** 1
17. Based on your choice of the value of the chi-squared test statistic in item 27, what conclusion would be made at 0.05 level of significance?
18. More drivers in Blantyre prefer Petroda service station
19. The level of preference for the service stations is the same for each service station
20. There is no difference between observed and expected sets of frequencies.
21. The level of preference is not the same among the service stations
22. What type of error is likely to have been committed in making the decision you have made in item **28**?
23. Type **I**
24. Type **III**
25. Standard error
26. No error was committed

**SECTION B (40 MARKS)**

Answer **ANY TWO** questions from this section.

**QUESTION 31**

1. To investigate the average amount spent each week on airtime by residents of a rural village, a random sample of 400 villagers was taken. The sample mean was found to be K35.00 with a sample standard deviation of K25.00.
2. Calculate the 95% confidence interval for the population mean.  *(3 marks)*
3. Find the sample size required to estimate the population’s mean weekly expenditure on airtime to within K3.00 of the sample mean with 90% confidence.  *(4 marks)*
4. Two groups **A** and **B** consist of 100 people each who have same amounts of bank loan. An interest rate discount is given to group **A**, but not group **B** (control group). The groups are otherwise treated the same by the bank. It is found that 75 people in group **A** repay the loan before the expiry of the loan period while 65 in group **B** repay the loan before the expiry of loan period.
5. Test whether the interested rate discount helps to facilitate loan repayment (use 5% level of significance).  *(12 marks)*
6. What type of error is likely to have occurred in part i. above.  *(1 mark)*

**(Total 20 marks)**

**QUESTION 32**

1. The percentage monthly changes in a bank’s advertisement costs were as shown below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Month, 2011 | Feb\* | Mar | Apr | May | Jun | Jul |
| Percentage change from previous month |  | 1.5 | 1.3 | 0.9 | 0.4 | -0.5 |

\*not available

1. Draw a line graph to show the data *(3 marks)*
2. Convert these figures to a series of chain-based index numbers of advertisement costs from March to July, 2011.  *(2 marks)*
3. Convert the chain-based indexes to fixed base indexes with March, 2011 as the base. Give all your indexes to 1 decimal place.  *(2 marks)*
4. A family monitors its expenditure on food and has noted that the amount spent on fruits has risen. The details are tabulated below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | July 2011 | | January 2012 | |
| *Fruit* | *Price* | *Consumption* | *Price* | *Consumption* |
| Oranges | K60 each | 15 | K75 each | 20 |
| Apples | K120/kg | 1.5 | K150/kg | 2kg |
| Bananas | K80/kg | 1.5kg | K75/kg | 1kg |
| Lemons | K25 each | 8 | K35 each | 10 |

1. Calculate the simple aggregate quantity index for July, 2011 using January, 2012 as the base period.  *(3 marks)*
2. Calculate the Laspeyres and Paasche price indexes using July, 2011 as the base period. Interpret your result for the family.  *(10 marks)*

**(Total 20 marks)**

**QUESTION 33**

* + - 1. The account balances for customers holding a particular type of a bank account are normally distributed with mean K205,000 and standard deviation K25,000.

1. Determine the probability that the account balance of a particular account of this type is between K200,000 and K250,000.

*(4 marks)*

1. The bank decides to grade such customers by account balances. It is decided that the lowest 33% should be graded as **Classic**, the highest 20.9% graded as **Platinum**, and the remaining graded as **Gold**. Determine the range of account balances which would qualify a customer for a Gold grade.  *(6 marks)*
   * + 1. The following set of data shows a supermarket’s quarterly sales in millions of kwacha recorded between 2009 and 2011.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **Sales (K’000,000)** | | | |
| **Jan-Mar** | **Apr-Jun** | **Jul-Sep** | **Oct-Dec** |
| **2009** | 4 | 6 | 4 | 10 |
| **2010** | 20 | 22 | 20 | 30 |
| **2011** | 36 | 50 | 40 | 70 |

1. Find the trend by means of moving average method.  *(5 marks)*
2. Using the additive model and the moving average trend calculated in i., obtain the average quarterly seasonal factors/indices (to 2 decimal places)  *(5 marks)*

**(Total 20 marks)**

**QUESTION 34**

1. State the Bayes’ Theorem. *(2 marks)*
2. The number of cases of fraud, *X*, that random occur within a particular bank follows a Poisson distribution with mean of 4 cases per year. Calculate the probability that in a given
   1. year there are at most 2 fraud cases within the bank *(4 marks)*
   2. 6-month period there are no fraud cases within the bank *(3 marks)*
   3. 18 –month period there are exactly 10 fraud cases. *(3 marks)*

1. Chichiri Machines Ltd supplies two types of banknote counting machines:

CMC-801model with average operation time before servicing of 2000 hours and standard deviation of 300 hours

CMC-901 model with average operation time before servicing of 2500 hours and standard deviation of 125 hours

Assuming that the times are normally distributed,

1. Find the probability that a randomly chosen CMC-801 machine will require servicing after 2300 hours. *(4 marks)*
2. Find the corresponding probability for a CMC-901 machine.

*(4 marks)*

**END OF EXAMINATION PAPER**