

**INSTITUTE OF BANKERS IN MALAWI**

**DIPLOMA IN BANKING EXAMINATION**

**SUBJECT: INTRODUCTION TO BUSINESS STATISTICS (OIBM-D212)**

**Date: Wednesday, 16th May 2018**

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

**INSTRUCTIONS TO CANDIDATES**

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

2 Section A consists of 4 questions, each question carries 15 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 books without examination numbers will not be marked.**

7 All persons writing examinations without payment will risk expulsion from the Institute.

8 If you are caught cheating, you will be automatically disqualified in all subjects seated this semester.

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

**SECTION A (60 MARKS)**

Answer **ALL** questions from this section

**QUESTION 1**

1. In quality control, variations in products are grouped into two classes. Mention the two classes of variations. *(2 marks)*
2. Write down any two components of time series. *(2 marks)*
3. Find the accrued amount, if MK5000 was invested at 5% simple interest per annum for a year.  *(3 marks)*
4. A certain service centre had 50000 customers in 2009. In 2010 it registered 70000 customers.

**Required:**

Find simple quantity index number using 2009 as a base year and interpret.

*(3 marks)*

1. In the context of linear programming, explain what a ‘feasible region’ is. *(2 marks)*
2. In an analysis of application forms for bank statements, applicants were classified by gender according to account type: Savings, Current and Investment. This is summarised in the following table:

|  |  |  |  |
| --- | --- | --- | --- |
| **Gender** | **Account Type** | | |
| Savings | Current | Investment |
| Male | 5 | 8 | 3 |
| Female | 3 | 4 | 2 |

**Required:**

If an application form is selected at random, what is the probability that it is from a savings account holder given that the applicant is male? *(3 marks)*

**(Total 15 marks)**

**QUESTION 2**

1. (i). How does ‘simple interest’ differ from ‘compound interest’?

*(2 marks)*

(ii). A principal amount accrues to MK8500 if it is compounded at 14.5% over 6 years.

**Required:**

Find the value of the principal amount. *(4 marks)*

1. A bank advertises money at 12% nominal interest but compounds monthly. Maziko enterprise borrowed one million kwacha and makes no repayment for 3 years.

**Required:**

(i). How much money will Maziko enterprise pay back to the bank by the end of 3 years? *(5 marks)*

(ii). Find the actual percentage rate (APR). *(4 marks)*

**(Total 15 marks)**

**QUESTION 3**

1. (i) State Bayes’ theorem.  *(2 marks)*

(ii) A bank supervisor has noted that her subordinate is happy on 60% of her calls. She has also noticed that if he is happy, he accedes to her request with a probability of 0.4 whereas if he is not happy, he accedes to her request with a probability of 0.1. The supervisor calls one day and he accedes to her request. Use Bayes’ theorem to find the probability of the subordinate being happy. *(6 marks)*

1. Demand for a product can take three levels: high, medium and low. The retail shop manager has assessed the probability of each level of demand and the corresponding profit and presented the details as follows:

|  |  |  |
| --- | --- | --- |
| **Level of Demand** | **Probability** | **Profit (K’000)** |
| High | 0.2 | 2 |
| Medium | 0.5 | 1.5 |
| Low |  | 0.75 |

**Required:**

1. Find the probability of the low level of demand.  *(2 marks)*
2. Calculate the expected value of profit. *(5 marks)*

**(Total 15 marks)**

**QUESTION 4**

1. A normally distributed population has a mean of 40 and a standard deviation of 12.

**Required**

State what the central limit theorem says about the sampling distribution of the mean if samples of size 100 are drawn from the population. *(3 marks)*

1. Statistics has revealed that the average weekly overtime wages for bank employees is MK24000. Assume that available data indicates that bank employees’ weekly overtime wages are normally distributed with standard deviation of MK8000.

**Required**

1. Find the probability that a randomly selected bank employee earns less than MK18000 in weekly overtime wages.  *(6 marks)*
2. If a sample of 36 bank employees is randomly selected, what is the probability that the sample mean weekly overtime wages exceeds MK25500? *(6 marks)*

**(Total 15 marks)**

**SECTION B (40 MARKS)**

Answer ANY **TWO** questions from this section

**QUESTION 5**

1. What is the difference between ‘Laspeyres index’ and ‘Paasche index’? *(2 marks)*
2. The following table shows the quantities and costs of materials for the four departments of a bank for 2015 and 2017.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Department** | **Quantity (tonnes)** | | **Cost (MK’000)** | |
| **2015** | **2017** | **2015** | **2017** |
| Treasury | 175 | 201 | 1540 | 1830 |
| E-Banking | 32 | 46 | 1270 | 1490 |
| Administration | 48 | 43 | 2760 | 2490 |
| Operations | 65 | 66 | 2190 | 2070 |

**Required:**

Taking 2015 as the base year, calculate

1. Laspeyres price index for 2017. *(8 marks)*
2. Paasche price index for 2017. *(8 marks)*
3. Fisher’s Ideal price index for 2017. *(2 marks)*

**(Total 20 marks)**

**QUESTION 6**

1. In hypothesis testing, explain how ‘Type II error’ may be committed. *(2 marks)*
2. The manager wishes to determine whether the waiting time to be assisted at the customer desk has changed in the past few months from its previous population mean value of 4.5 minute. He collects data from 10 randomly sampled customers and calculates the mean of 4.7 minutes and a standard deviation of 1 minute.

**Required:**

1. Would you use ‘one-tailed test’ or ‘two-tailed test’? Explain!  *(2 marks)*
2. State the null hypothesis and alternative hypothesis.  *(2 marks)*
3. If t-distribution is considered to be appropriate, formulate the decision rule showing rejection region(s) on the t-distribution graph.

(Take alpha = 0.05). *(3 marks)*

1. Calculate the test statistic.  *(3 marks)*
2. Make a decision and a conclusion on the basis of the results obtained above.  *(2 marks)*
3. Syndicate Bank found that out of 200 borrowers, 32% defaulted in payment of their loans.

**Required:**

Estimate a 99% confidence interval for the proportion of defaulters and interpret.  *(6 marks)*

**(Total 20 marks)**

**QUESTION 7**

1. What is ‘statistical quality control’? *(2 marks)*
2. A machine is set to deliver packets of given weight. Ten samples of size 5 each were recorded and calculated means for each sample were as follows:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 43 | 49 | 37 | 44 | 45 | 37 | 50 | 46 | 42 | 47 |

Assume that the standard deviation of weights is 4.

**Required:**

1. Calculate the central line, upper control limit and lower control limit. *(3 marks)*
2. Draw a control chart for mean weights. *(5 marks)*
3. Comment on the state of control of the process.  *(2 marks)*
4. A firm is considering two separate capital projects with cash flows as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Project** | **Initial**  **cost** | **Net cash flow** | | | | |
| Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| Project A | (80000) | 1800 | 20000 | 25000 | 38000 | 45000 |
| Project B | (120000) | 30000 | 50000 | 50000 | 50000 | 15000 |

**Required:**

Using the net present value (NPV) criterion and a discount rate of 15%, choose the project that is more profitable. *(8 marks)*

**(Total 20 marks)**

**QUESTION 8**

1. Write down any two major components of a linear programming model. *(2 marks)*
2. A manufacturer of cell phones makes a profit of MK25000 on a deluxe model and MK30000 on a standard model. The company wishes to produce at least 80 deluxe models and at least 100 standard models per day. To maintain high quality, the daily production should not exceed 200 cell phones.

**Required**

1. Formulate a linear programming model for this problem.  *(5 marks)*
2. How many of each type should be made daily to maximize the net

profit? (Use a graph paper!) *(7 marks)*

1. What is the maximum profit?  *(2 marks)*
2. Find the percentage increase in profit if daily production of both types of cell phones is allowed to reach at 240. *(4 marks)*

**END OF EXAMINATON PAPER**