

**INSTITUTE OF BANKERS IN MALAWI**

**DIPLOMA IN BANKING EXAMINATION**

**SUBJECT: INTRODUCTION TO BUSINESS STATISTICS (IOBM – D212)**

**Date: Wednesday, 14th November 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 20 multiple questions, each question carries 2 marks.

Answer **ALL** questions.

3 Section B consists of 5 questions, each question carries 20 marks. Answer **ANY THREE** questions.

4 You will be allowed **10 minutes** to go through the paper before the start of the examination when 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. All answer books without examination number 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. Mrs Kamoto leaves K8,000 in the bank for 5 years at 10% compounded biannually (i.e. half yearly).

**Required:**

Find how much interest her money has earned over that period. *(5 marks)*

(b) A bank wishes to check the accuracy of data entry as undertaken by its tellers. Data entry is done by 3 tellers, A, B and C. A sample of 1,000 transactions is selected. 300 transactions were input by A, 300 by B and 400 by C. The error rates of A, B and C were found to be 2%, 5% and 3% respectively. From the sample of 1,000 transactions, one transaction was selected.

**Required:**

Calculate the probability that

1. It does not contain an error. (*5 marks)*
2. It was input by C given that it contained an error. (*5 marks)* **(Total 15 Marks)**

**QUESTION 2**

1. Cite any **two** properties of the Binomial distribution. *(2 marks)*

(b) According to the Bankers Association of Malawi, it is estimated that only 15% of the population have access to commercial banks in the country.

**Required:**

In a random sample of 20 people, determine the probability that

1. exactly 7 people have access to commercial banks in the country.

*(4 marks)*

1. at least 3 people have access to commercial banks in the country.

*(5 marks)*

(c) A bank wishes to open a service centre at Jenda and it has estimated that over a five year period its distribution of profits with corresponding probabilities will be as follows:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | 1 | 2 | 3 | 4 | 5 |
| Profit (MK million) | - 20 | 25 | 40 | 80 | 120 |
| Probability | 0.2 | 0.3 | 0.3 | 0.1 | 0.1 |

**Required:**

Find the expected profit over the five year period.  *(4 marks)*

**(Total 15 marks)**

**QUESTION 3**

(a) Distinguish between a discrete random variable and continuous random variable, **giving an example** on each for illustrative purposes. *(4 marks)*

1. A bank is planning to undertake a project requiring initial investment of K50 million and is expected to generate the following returns:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Year** | 1 | 2 | 3 | 4 | 5 |
| **Returns**  **(K million)** | 10 | 13 | 16 | 19 | 22 |

**Required:**

Find the payback period for the project. *(4 marks)*

(c) (i) Briefly explain the significance of the Central Limit Theorem in statistical inference. *(2 marks)*

(ii) A large bank wishes to estimate the average number of customers that are served by its tellers over a one-hour period. A random sample of 50 tellers across the country is chosen and the average number of customers served is 32 customers with a standard deviation of 6 customers.

**Required:**

Find the 96% confidence interval for the mean number of customers served. *(5 marks)*

**(Total 15 Marks)**

**Question 4**

(a) Briefly describe the **four** major steps that are followed when conducting a statistical test. *(8 marks)*

1. The wholesale price index of a shop is made up of the prices of three items. The prices of the items and weighting in 2015 and 2018 for each item are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Item | 2015 price (K) | 2018 price (K) | Weight |
| Margarine  Cooking oil  Sugar | 500  1500  600 | 750  2000  850 | 60  20  40 |

**Required:**

1. Calculate the weighted average price index of the shop for 2018 using 2015 as the base year. *(3 marks)*
2. Interpret the result obtained in part (i). *(2 marks)*
3. Explain **one** major limitation of this index. (*2 marks)*  **(Total 15 marks)**

**SECTION B (40 MARKS)**

Answer any **TWO** questions from this section

**QUESTION 5**

(a) List down **three** major elements that make up a linear programming model. *(3 marks)*

(b) A bank is planning to finance a fast food chain which intends to expand by opening several new restaurants. The chain operates two types of restaurants, drive-through and full-service. A drive-through restaurant costs K1 million to construct, requires 5 employees and has an expected annual revenue of K2 million. A full-service restaurant costs K1.5 million to construct, requires 15 employees and has an expected annual revenue of K5 million. The chain has K24 million in capital available for expansion. Labour contracts require that they hire no more than 210 employees and licensing restrictions require that they open no more than 20 new restaurants.

**Required:**

(i) How many restaurants of each type should the chain open in order to maximise the expected revenue and what is the maximum expected revenue? *(15 marks)*

(ii) How much of their capital will they use? *(2 marks)*

**(Total 20 Marks)**

**QUESTION 6**

a) Briefly describe any **two** components of a time series, illustrating each with an example. *(4 marks)*

b) (i) Define an index number and state any **two** uses of index numbers.

*(4 marks)*

(ii) A bank has recently undergone re-organisation. The following table provides a summary of the distribution of employees and their weekly overtime (in K’00) due.

|  |  |  |
| --- | --- | --- |
| Department | Number of employees Year 2008 2013 2018 | Weekly overtime (K’00) Year 2008 2013 2018 |
| Credit Treasury e-banking | 180 210 225 270 230 180 450 340 220 | 470 505 540 355 360 375 275 255 250 |

**Required:**

Using the year 2008 as base year, calculate the following:

1. Simple aggregate price indices for 2013 and 2018*.* *(4 marks)*
2. Laspeyres price index for 2018. (*4 marks)*
3. Paasche quantity index for 2013. (*4 marks)*  **(Total 20 marks)**

**Question 7**

(a) Customers arrive randomly at a bank’s customer care desk at an average rate of 3.4 per minute. It is assumed that the customer arrivals follow the Poisson probability distribution.

**Required:**

Calculate the probability that

i) No customer arrives in any particular minute. *(3 marks)*

ii) Two or more customers arrive in any particular minute. *(5 marks)*

iii) One or more clients arrive in any 30-second period.  *(6 marks)*

(b) A financial analyst claims that the average number of cheques that are referred to drawer at Rukuru Bank is 35. A random sample of 64 service centres shows a mean size of 37 cheques with a standard deviation of 6 cheques referred to drawer.

**Required:**

Test at 5% level of significance if the claimed value is too low. (*6 marks)*

**(Total 20 marks)**

**Question 8**

(a) Cite any **three** uses of the normal distribution. *(3 marks)*

(b) The following is a record of the number of fraud cases registered at Zaone Bank over a 3 year period.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **Number of fraud cases** | | | |
| **Jan-Mar** | **Apr-Jun** | **Jul-Sep** | **Oct-Dec** |
| **2015** | 4 | 6 | 4 | 10 |
| **2016** | 20 | 22 | 20 | 30 |
| **2017** | 36 | 50 | 40 | 70 |

**Required:**

(i) Construct a graph for the time series data given. *(5 marks)*

(ii) Find the trend by means of moving average method. *(6 marks)*

(iii) Using the additive model and the moving average trend calculated in (ii), obtain the average quarterly seasonal factors/indices (to 2 decimal places). (*6 marks)*

**(Total 20 marks)**

**END OF THE EXAMINATION PAPER**