CHARTERED INSTITUTE OF BANKERS, GHANA

ASSOCIATESHIP EXAMINATION

LEVEL II

QUANTITATIVE METHODS FOR DECISION-MAKING
OCTOBER 2022

N.B.

1. **Read carefully the instructions on the cover of the answer book.**

2. **Answer any FOUR (4) questions. Marks for subdivisions of questions are shown in brackets.**

3. **Each question carries 25 marks.**

4. **No books, dictionaries, notes or any other written materials are allowed in this examination.**

5. **Calculators, including scientific calculators are allowed provided they are not programmable and cannot store or recall information. Electronic calculators and personal organizers are not allowed. All workings should be shown.**

6. **Materials provided:**
   - **Formulae sheets and tables for the Normal and Chi-Squared distributions**
   - **Graph sheets**

7. **Time allowed: THREE (3) HOURS.**

8. **Candidates must ensure that they answer questions in the appropriate answer book and <u>NOT</u> on loose sheets which are supplementary sheets. Such answers will not be marked.**

9. **DO NOT WRITE YOUR NAME ON THE ANSWER BOOK.**

10. **DO NOT OPEN THIS QUESTION BOOK UNTIL YOU HAVE BEEN INSTRUCTED TO DO SO.**

QUESTION ONE

The following frequency table indicates the number of individuals with minimum balance in their Current Accounts at MUMUADU Rural Bank.

Minimum Balance in Ghana Cedis (GHS)	Frequency
0 and 1,000.00	1200
1,000 and under 2,000	150
2,000 and under 3,000	250
3,000 and under 4,000	230
4,000 and under 5,000	50
5,000 and under 6,000	5
6,000 and under 7,000	2
7,000 and under 8,000	1

(a) Explain (in your own words) the following terms in relation to the various balances on the accounts.
    (i)   Class width   [2 Mark]
    (ii)   Class limits   [2 Mark]
    (iii)   Group relative percentage frequencies   [2 Mark]

(b) Calculate ,
    (i)   The Class width   [4 Marks]
    (ii)   The Class limits   [4 Marks]
    (iii)   The group relative percentage frequencies of each group   [4 Marks]

(c) Using (b)(iii) above draw a group relative percentage histogram for the Account Balances at MUMUADU Rural Bank.   [7 Marks]
[Total: 25 Marks]

QUESTION TWO

The following data were obtained from a survey requesting Thirty (30) different families in Accra to list their weekly expenditure on food:

105	85	72
64	106	86
87	78	108
145	102	86
74	72	103
94	63	73
89	75	88
88	107	101

(a) Calculate
  (i) The 20th percentile expenditures [3 Marks]
  (ii) The 80th percentile expenditures [3 Marks]
  (iii) The interquartile range [3 Marks]

(b) Calculate
  (i) The mean [3 Marks]
  (ii) Median [3 Marks]
  (iii) Standard deviation [3 Marks]
  (iv) Coefficient of skewness [3 Marks]

(c) Write a brief description of the survey results; interpret each of the values of the statistics in (a) and (b) above. [4 Marks]

[Total: 25 Marks]

QUESTION THREE

Two competing companies (Star-Television and Multi-Television) offer digital television service to a city of 100,000 households. The changes in digital TV subscriptions each year are shown by the transition matrix P below:

$$P = \begin{bmatrix} 0.70 & 0.15 & 0.15 \\ 0.20 & 0.80 & 0.15 \\ 0.10 & 0.05 & 0.70 \end{bmatrix} \begin{matrix} S \\ M \\ None \end{matrix}$$

$$\begin{matrix} S & M & None \end{matrix}$$

The current populations in the three states is

$$X = \begin{bmatrix} 15,000 \\ 20,000 \\ 65,000 \end{bmatrix}.$$

(a) If P remains the same year after year, find the number of subscribers after
(i) 3 years [8 Marks]
(ii) 5 years [8 Marks]
(b) If P remains the same year after year, find the number of subscribers in the long run. [9 Marks]

  Hint: *PX=X in the long run.*

[Total: 25 Marks]

QUESTION FOUR

The total revenue and total cost for a product are related to production x by:

$$TR = 14X - X^2 + 2000$$

$$TC = X^3 - 15X^2 + 1000$$

(a) Explain briefly (in your own words) the following terms in relation to the total revenue and total cost above:

    (i)   Marginal Cost   [2 Mark]

    (ii)   Marginal Revenue   [2 Mark]

    (iii)   Marginal Profit   [2 Mark]

    (iv)   Average Revenue   [2 Mark]

(b) Calculate, how many units should the company produce in order to

    (i)   Maximize total revenue   [4 Marks]

    (ii)   Minimize cost   [4 Marks]

    (iii)   Maximize profit.   [4 Marks]

    (iv)   Comment on (i), (ii) and (iii) above.   [5 Marks]

[Total: 25 Marks]

QUESTION FIVE

Nationwide, about 27% of mortgage-paying home owners spent 30% or more of their income on housing costs. Upper East region residents paid the largest percentage at 41% and the Greater Accra residents the smallest at 17.5%. Eight regions were randomly selected, and the median household income(X) in thousands and percentage of mortgage -paying homeowners whose housing costs exceed 30 % of their income (Y) are as follows:

Regions	Greater Accra	Upper East	Bono East	Ashanti	Volta	Eastern	Western	Savannah
X	46.5	51.1	37.1	36.4	33.5	35.2	45.6	28.6
Y	37.2	41.0	20.6	24.3	22.0	17.5	30.0	23.0

(a) Briefly explain the term (X,Y) is bivariate data   [3 Marks]

(b) Draw

    (i)   Scatter diagram for the data above   [3 Marks]

    (ii)   a line through the points   [3 Marks]

(c) Using (b) comment on the relationship between X and Y.   [3 Marks]

(d) Calculate the least square line   [8 Marks]

(e) Comment on the lines in (b)-(ii) and (d) above.   [5 Marks]

[Total: 25 Marks]

QUESTION SIX

A lot of investors have been reading about something called the "new-fund effect". That is the tendency of new funds to outperform their older peers because of any one of a number of factors: better access to initial public offerings, more motivated managers, or better spreads on trades. However, despite the potential growth benefits of new funds, their volatility makes many investors uncomfortable. Consider a sample of 10 newly M- mutual funds and a sample of 10 newly Q-mutual funds randomly selected from all mutuals funds in Ghana that are less than 18 months old as follows:

Annualized Performance of Newly M- Mutual Funds	Annualized Performance of Newly Q-Mutual Funds
13.7	15.3
7.9	9.8
13.6	13.6
11.4	8.6
14.6	15.2
9.5	14.9
10.8	11.5
11.3	25.2
12.0	6.3
12.7	12.4

Using a hypothesis testing procedure, investigate whether there is sufficient evidence to conclude that there is a significant difference in variance of newly created M and Q mutual funds.

[Total: 25 Marks]