CHARTERED INSTITUTE OF BANKERS, GHANA

ASSOCIATESHIP EXAMINATION

LEVEL II

QUANTITATIVE METHODS FOR DECISION-MAKING

APRIL 2024

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 sheet 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 **NOT** 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 PAPER UNTIL YOU HAVE BEEN INSTRUCTED TO DO SO.

ANSWER ANY FOUR QUESTIONS

QUESTION 1

Dokument Courier Services has two Vans which it uses for deliveries. The first (X) can carry 10 of Product A or 4 of Product B. The second (Y) can carry 3 of A or 5 of Product B. Minimum deliveries are 200 of A and 150 of B. In order to maintain roadworthiness, each lorry must be used for a minimum of two journeys per week. Suppose the running costs are GHS2000.00 per journey for Lorry X and GHS 1500.00 per journey for Lorry Y, find the number of deliveries made by each lorry to minimize costs. If the aim of the manager of Dokument is to minimize costs,

    (a) Identify the decision variables.   [5 Marks]
    (b) Formulate the problem into a linear programming problem (LPM).   [5 Marks]
    (c) Display the LPM on a graph and shade the critical region.   [5 Marks]
    (d) Use the graphical approach to solving the LPM   [10 Marks]

[Total: 25 Marks]

QUESTION 2

The Dean of Students of a premier private university in Ghana has been given the responses of 18 students to a question on how much money (in GHS) they have spent on textbooks in the last semester:

0	0	19.99	32.98	19.99	19.99
48.20	32.98	0	19.99	0	32.98
19.99	0	24.50	0	32.98	24.50

    (a) Sketch graphs (not drawn to scale) which will show the relationship between the mean, median and mode, and the shape of the distribution when the data above is
        (i)   Negative Skew   [2 Marks]
        (ii)   Positive Skew   [2 Marks]
        (iii)   Symmetric   [2 Marks]

    (b) Determine, the
        (i)   Mean   [5 Marks]
        (ii)   Median   [5 Marks]
        (iii)   Mode   [5 Marks]

(c) Using your answer in (a) and (b) above, give a detailed comment on the distribution of the responses of the 18 students, to the Dean. [4 Marks]

[Total: 25 Marks]

QUESTION 3

Mumuadu Community Bank Ltd's Personnel Department now has records on ten (10) recent employees that give an aptitude score and an interview ranking, as displayed below:

Employee	Aptitude Score	Interview Ranking
A	38	10
B	59	5
C	68	8
D	40	7
E	14	9
F	33	1
G	87	2
H	71	3
I	62	3
J	81	6

(a) State the situation under which the Spearman's Rank Correlation Coefficient is a suitable measure of correlation. [5 Marks]

(b) Determine a suitable measure of correlation [15 Marks]

(c) Comment on your correlation value in (b) above [5 Marks]

[Total: 25 Marks]

QUESTION 4

Kiki, the commercial mango seller has collected demand figures for mangos over the last 15 months in the table below:

Month	Demand
1	470
2	510
3	460
4	490
5	520
6	460
7	1500
8	1450
9	1550
10	1500
11	1480
12	1520
13	1500
14	1490
15	1500

(a) Explain briefly the term "Exponential Smoothing" in Time Series Analysis of the data above.

[3 Marks]

(b) Use an initial forecast of 500 to compare Exponential Smoothing Forecasts with Smoothing Constant Values a= 0.1 and a=0.4.   [10 Marks]

(c) Plot the actual values of the time series, and superimpose the forecast for the Smoothing Constant Values a= 0.1 and a=0.4 on the graph of the actual values.

[10 Marks]

(d) Comment on the suitability of the forecast from the Smoothing Constant Values
    a= 0.1 and a=0.4.   [2 Marks]
    [Total: 25 Marks]

QUESTION 5

An Actuary in an insurance company formulates insurance policies that will be both profitable and marketable. For a particular policy, the lifetimes of the policyholders follow a normal distribution with a mean of 66.20 years and standard deviation of 4.4 years. One of the options with this policy is to receive a payment following the 65th birthday and a payment every five years thereafter. Let X be the age at death (in years) of a policyholder

(a) Draw the graph of the distribution of X showing clearly the key decision numbers i.e. 66.2 years, 4.4years, 65years, 70years, 75years.   [4 Marks]

(b) Determine the

    (i)   percentage of policyholders who will receive at least one payment using the option above.   [7 Marks]

    (ii)   percentage of policyholders who will receive two or more payments. [7 Marks]

    (iii)   percentage of policyholders who will receive exactly two payments. [7 Marks]

[Total: 25 Marks]

QUESTION 6

The Management of a Rural Bank must decide between two proposals, on the basis of the following information:

Proposal	Investment Now	Net Cash Inflow at the End of		
		1991	1992	1993
A	GHS 80,000	GHS 95,400	GHS 39,400	GHS 12,000
B	GHS 100,000	GHS 35,000	GHS 58,000	GHS 80,000

Assume that on Projects of this type the company can earn 14 percent per annum.

(a) Explain briefly the term Net Discount Value in relation to the projects.   [5 Marks]

(b) Calculate the Net Discounted Value of Proposal A.   [8 Marks]

(c) Calculate the Net Discounted Value of Proposal B.   [8 Marks]

(d) Using the values in (a) and (b), advise Management regarding the proposal that should be selected.   [4 Marks]

[Total: 25 Marks]