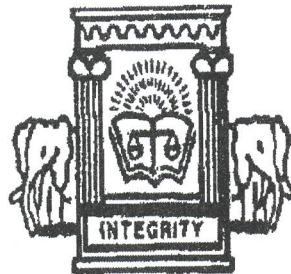


INSTITUTE OF CHARTERED ACCOUNTANTS (GHANA)



MAY 2011 EXAMINATIONS
(PROFESSIONAL)

PART 2

QUANTITATIVE TOOLS IN BUSINESS
(Paper 2.1)

Attempt five (5) Questions in ALL

TIME ALLOWED:

Reading & Planning	-	15 Minutes
Workings	-	3 Hours

QUESTION 1

Eno Mary wants to accrue GHS100,000 in 10 years, so she can start a business. A uniform amount will be invested at the end of each year to achieve this.

Required:

- a) Draw the time-line for this investment. (2 marks)
- b) What is the uniform value if the investment is expected to yield 7% interest compounded annually? (5 marks)
- c) If Eno Mary deposits GHS6,000 each year, to accumulate the same amount at 7% interest compounded annually, how many years will it take her to achieve the same amount? (8 marks)
- d) What one-time investment today will result in the same amount in 10 years at a rate of 7% interest compounded annually? (3 marks)
- e) Redraw the timeline for (d) above indicating only the present and future value points. (2 marks)

(Total: 20 marks)

QUESTION 2

Kaya-Kaya Limited makes two puddings, Vanilla and Chocolate. Each serving of Vanilla pudding requires 2 teaspoons of sugar and 25 fluid measure of water, and each serving of chocolate pudding requires 3 teaspoons of sugar and 15 fluid measure of water. Kaya-Kaya has available each day 3,600 teaspoons of sugar and 22,500 fluid measure of water. Kaya-Kaya makes no more than 600 servings of Vanilla pudding because that is all that it can sell each day. Kaya-Kaya makes a profit of GHS10 on each serving of vanilla pudding and GHS7 on each serving of chocolate.

Required:

- (i) Formulate a linear programming problem. (4 marks)
- (ii) Construct an initial simplex tableau. (3 marks)
- (iii) Perform the first iteration of the initial simplex tableau. (4 marks)

- (iv) Using simplex method, determine how many servings of each type of pudding Kaya-Kaya should make to maximise profit. (9 marks)

(Total: 20 marks)

QUESTION 3

- a) (i) Define a transition matrix. (2 marks)
- (ii) State **two (2)** characteristic features of a transition matrix. (2 marks)
- b) A chemical reaction in a processing plant is given by:

$K = T^2 P^{-1}$, where T is an input matrix, P^{-1} an inverse of matrix P and K an output matrix.

Given that $T = \begin{bmatrix} 2 & 4 \\ 2 & 0 \end{bmatrix}$ and $P = \begin{bmatrix} 1 & 7 \\ 0 & 4 \end{bmatrix}$

Required:

Calculate the output matrix K. (4 marks)

- c) ABC Company Ltd is the sole producer of 3 cosmetic products Abay, Babay and Cabay which currently have a market share of 40%, 40% and 20% respectively.

Each week some brand switching takes place. Of those who bought Abay the previous week, 60% buy it again whilst 20% switch to Babay and 20% to Cabay. Of those who bought Babay the previous week, 50% buy it again whilst 40% switch to Abay and 10% to Cabay. Of those who bought Cabay, 80% remain loyal whilst 10% switch to Abay and 10% to Babay.

Required:

- (i) Construct a probability transition matrix of the switching probabilities. (2 marks)
- (ii) Construct a vector to represent the initial market share in percentages. (1 marks)
- (iii) Calculate a new market share a week after the current market share. (2 marks)
- (iv) Calculate a new market share 2 weeks after the current market share. (2 marks)

(v) Compute the equilibrium market share of the company's products.

(5 marks)

(Total: 20 marks)

QUESTION 4

- a) Distinguish between activity-on-node and activity-on-arrow diagrams in network analysis. (2 marks)
- b) The table below represents a project to install a new computerized accounting system in an organisation.

Activity	Duration (days)			Preceding Activity
	Optimistic	Most likely	Pessimistic	
A	5	8	10	G,H
B	3	5	7	-
C	4	7	12	I
D	8	10	12	-
E	6	6	6	D,I
F	2	3	5	B,C
G	1	3	5	C,F
H	7	8	9	C,E
I	3	5	8	-

Required:

- (i) Calculate the mean duration and standard deviation for each activity. (3 marks)
- (ii) Draw a network diagram that can determine the minimum mean project duration. (7 marks)
- (iii) Assume the project duration is normally distributed. Calculate the probability that the project would be completed within 34 days. (4 marks)
- (iv) If the project is completed within 34 days, a bonus of GHS500 is paid to the installation team otherwise a penalty of GHS10,000 is placed on the team.

Required:

Calculate the expectation of the two scenarios.

(4 marks)

(Total: 20 marks)

QUESTION 5

- a) State any **two (2)** methods of data collection and indicate the type of data each method is suitable for. **(3 marks)**
- b) The following are marks (%) obtained by 70 candidates in a Quantitative Methods paper:

77	68	70	84	68	38	72	82	86	22
66	90	87	53	30	39	28	26	70	38
39	23	50	33	30	64	20	84	49	27
25	79	37	92	80	30	96	80	62	64
25	87	45	96	78	69	40	89	48	41
60	28	99	29	25	95	96	49	80	60
49	24	57	96	97	81	23	55	95	89

Required:

- (i) Construct a frequency distribution table for marks obtained using classes: 20 – 29, 30 – 39, 40 – 49, 50 – 59, 60 – 69, 70 – 79, 80 – 89, 90 – 99. **(4 marks)**
- (ii) Draw a histogram for marks obtained using the distribution constructed in (i) above. **(7 marks)**
- (iii) From your histogram in (ii) above determine the first, second, third quartiles and the modal mark. **(4 marks)**
- (iv) Calculate an appropriate coefficient of skewness and hence describe the distribution of marks obtained. **(2 marks)**
- (Total: 20 marks)**

QUESTION 6

The process of filling containers with liquid soap at a soap making factory is normally distributed with mean 475 litres and standard deviation 20 litres.

Required:

- (a) Calculate the probability that the volume of liquid soap delivered will be
- (i) Less than 480 litres **(3 marks)**
- (ii) Between 460 litres and 490 litres **(3 marks)**

(iii) More than 490 litres

(3 marks)

(b) If the containers for the liquid soap have a capacity of 500 litres,

Required:

Calculate the probability that the amount of liquid soap poured into a container is greater than the capacity of the container and so overflows. (5 marks)

(c) To reduce the problem of overflow containers an engineer can adjust the mean value that is poured.

Required:

To what should the mean value be adjusted so that the probability of overflowing is 0.001?

(6 marks)

(Total: 20 marks)

QUESTION 7

(a) State **four (4)** properties of linear correlation coefficient.

(4 marks)

(b) A manager of a small accounting firm measures the dexterity and output levels of staff in the firm. The following table shows the results of the exercise:

Output level	Dexterity
86	6
51	4
101	7
91	10
77	4
58	7
75	9
110	8
99	9
106	6
52	8
44	5
88	4
67	9
63	2

Required:

- (i) Construct a scatter diagram of the data. (4 marks)
- (ii) Compute the linear correlation coefficient. (6 marks)
- (iii) Compute the rank correlation coefficient. (4 marks)
- (iv) Based on your results from (ii) and (iii), which of the two methods is preferable? (2 marks)

(Total: 20 marks)