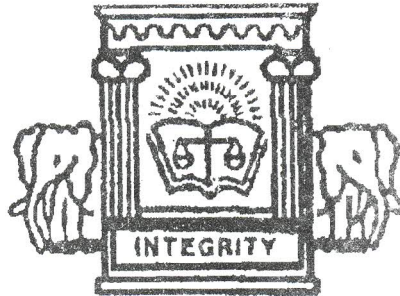# THE INSTITUTE OF CHARTERED ACCOUNTANTS (GHANA)

INTEGRITY

NOVEMBER 2005 EXAMINATIONS
(PROFESSIONAL)

QUANTITATIVE TECHNIQUES
(Special Paper)

Attempt ANY Five (5) Questions

TIME ALLOWED: 3 HOURS

QUESTION 1

Personal savings, as a percentage of personal disposable income over a three-year period (2002 – 2004), is given below:

| Year | Quarter | | | |
	1	2	3	4
2002	9.6	8.1	7.5	5.3
2003	12.1	7.1	7.1	5.7
2004	11.4	8.2	7.8	6.7

Required:

Using the multiplicative model and the method of moving averages:

(a)   obtain the trend.   (6 marks)

(b)   determine the average seasonal variations.   (6 marks)

(c)   interpret the average variation for the third quarter obtained in
      (b) above.   (2 marks)

(d)   forecast the percentage of personal disposable income in the third quarter of
      the year 2005.

                                                                          (6 marks)

                                                          (Total: 20 marks)

QUESTION 2

The price per share (in hundred cedis) of a company quoted on the Ghana Stock Exchange at the close of business in forty (40) successive Fridays is summarized in the following frequency distribution:

Price per share (¢'00)	No. of days
21 - 25	3
26 - 30	5
31 - 35	8
36 - 40	12
41 - 45	6
46 - 50	4
51 - 55	2

Required:

(a)　Compute:

      (i)　the mean
      (ii)　the median
      (iii)　the standard deviation
      (iv)　the semi-interquartile range for the above distribution.

(17 marks)

(b)　Comment on the shape of the distribution.　(3 marks)

(Total: 20 marks)

QUESTION 3

Mr Kofi Bruce is thinking of starting the production of sachet water (pure water). He can purchase a machine now for ¢100 million. Being a former financial director of a bank, he estimates that the machine will contribute ¢60 million per annum to profits for five (5) years after which time it will have to be scrapped for ¢5 million to be received at the end of the fifth year. The interest rate for the period is assumed to be 20% per annum.

Required:

(a)　Use the NPV method to determine if the machine is worth purchasing by Mr Bruce. (Assume that all inflows occur at year-ends).

(8 marks)

(b) The Worker-friendly Bank Limited, has introduced a new product in the form of Employees' Instalment Loan (EIL) where loans taken by employees are at a low interest rate of 15% per annum compounded semi-annually. Any loan taken by an employee is amortised by equal semi-annual payments over the next three (3) years. The first is due in six (6) months.

Required:

If an EIL of ¢5 million is taken by an employee:

(i) find the semi-annual payment.

(ii) construct an amortisation schedule for the debt.

(12 marks)

(Total: 20 marks)

QUESTION 4

A project involves the completion of eleven (11) activities. The table below gives the activity labels, the necessary immediate predecessors and time required to complete each activity.

Activity	Immediate Predecessors	Time (days)
A	-	26
B	A	16
C	B	20
D	C	18
E	D	22
F	E	20
G	D,F	16
H	E	12
I	H	14
J	G,I	28
K	J	36

Required:

(i) Draw the network of the project. (6 marks)

(ii) Draw the GANTT chart of the project. (8 marks)

ii. Determine the Total floats and Free floats of the activities.

(6 marks)

QUESTION 5

The marketing department of Adom Breweries Limited has the following data on its profits and advertising expenditure over the past ten years.

Year	Profits (¢ billion) Y	Advertising expenditure (¢ million) X
1	6.1	50
2	7.2	58
3	8.0	61
4	8.5	63
5	11.3	70
6	12.1	70
7	14.1	100
8	14.6	105
9	15.1	110
10	15.2	120

Required:

(a)

    i.   Calculate the product-moment correlation coefficient.

                                (9 marks)

    ii.   Calculate the coefficient of determination. What does this tell you?

                                  (3 marks)

(b)   By regressing profits (Y) on advertising expenditure (X), estimate the equation: $Y = a + bx$. (4 marks)

(c)   Forecast the profits for next year if in the company's budget for next year, ¢30 million has been allocated to advertising expenditure.

                                  (2 marks)

(d)   If the company thinks that profit should be raised to about ¢20 billion, how much should be allocated to advertising expenditure?

                                  (2 marks)

(Total: 20 marks)

QUESTION 6

The demand function for an electronic component manufactured by Supreme Electronic Company Limited, a sole manufacturer of the component, has been estimated to be:

$$p = 3.5 - 0.5x$$

and the total cost of producing the part (in millions of cedis) is

$$c = 0.04x^3 - 0.3x^2 + 2x + 1$$

where

p = price per unit (in ¢000)
x = level of output produced and sold (in thousand units)
c = total cost of production (in ¢ million)

Required:

Determine the:

(a)	Marginal cost (MC) function.	(2 marks)
(b)	Marginal revenue (MR) function.	(3 marks)
(c)	Marginal profit (MP) function.	(2 marks)
(d)	Profit maximising output level.	(9 marks)
(e)	Maximum profit.	(4 marks)

(Total: 20 marks)

QUESTION 7

A detergent producing company in Ghana, makes among other products, two (2) similar brands of soap labelled as Luv (X) and star (Y). Both contain a perfume agent, CHO1 and a colouring agent, CHO2.

Each cake of Luv soap contains 2.5 grams of CHO1 and 5.0 grams of CHO2, whereas each cake of Star soap contains 5.0 grams of CHO1 and 2.5 grams of CHO2. Each Luv soap generates a profit of ¢500 and each star soap a profit of ¢200.

For a particular production run, 80 kilograms of CHO1 and 70 kilograms of CHO2 are available. Marketing considerations restrict the number of Luv soap produced to not more than 10,000 cakes but there is no such restriction on Star soap.

Required:

(a) Formulate this as a linear programming problem. (5 marks)

(b) Draw a graph to represent this problem and identify the feasible region. (4 marks)

(c) Use the graph to obtain the output mix of the two brands of soap that would maximise profits on a production run.

(5 marks)

(d) What will be the level of profit? (1 mark)

(e) Which of the two agents, perfume (CHO1) and colouring (CHO2), is a scarce resource? Why? (1 mark)

(f) If management is contemplating buying additional units of the scarce agent, how much should it pay as maximum price?

(4 marks)

(Total: 20 marks)