THE INSTITUTE OF CHARTERED

ACCOUNTANTS (GHANA)

MAY 2012 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

(a) The National Theater sells ticks for GHC800 each with Pensioners receiving a discount of GHC2.00. One evening the theater sold 525 tickets and realized GHC3,580 in revenue. Using "a" to represent one type of ticket and "b" for the other.

Required:

Use matrix techniques to compute how many of each type of ticket was sold.

(***7 marks***)

(b) A man has GHC60,000 to invest. How much of GHC60,000 should his broker invest at 11% and how much at 15% to earn 14% on the total investment?

(***6 marks***)

(c) A Fruit Juice Company wants to mix fruits worth GHC45 a pound with another fruit worth GHC85 a pound to obtain 200 pound of fruit mixture worth GHC70 a pound. How much of each type of fruit should go into the mixture?

(***7 marks***)

(**Total: 20 marks**)

QUESTION 2

Your company has decided to make major alterations to its automated stock handling system in one of its warehouses. You have been asked to supervise this exercise. You have identified the key activities required for the exercise as shown below.

Key Activities for Alteration Works

Activity	Duration (days)	Preceding Activity
A	3	C,K
B	2	—
C	3	B
D	5	G
E	6	C,D
F	5	E
G	5	—
H	10	A
I	7	D
J	4	F,H,I
K	3	—

Required:

(a) Draw the network diagram for this project.

(***6 marks***)

(b) Determine the critical path and project duration.

(***2 marks***)

(c) Determine the probability that the project will take longer than 26 days assuming the project duration is normally distributed with mean of 24.3 days and standard deviation of 1.1553 days. (***4 marks***)

(d) Using a graph sheet provided, draw a Gantt Chart for the project. (Assuming activities start at the earliest start times) (***5 marks***)

(e) The project was halted after day 15. Using the Gantt Chart in (d) above determine the activities that were curtailed when the project5 was halted. (***3 marks***)

(**Total: 20 marks**)

QUESTION 3

Sure Step Company produces three types of shoes which are labeled A, B and C. The three types of shoes differ with respect to shape and materials used. Each type of shoe requires a certain amount of skilled labour, leather and glue, as shown in the table below:

Requirements	Shoe Types		
	A	B	C
Skilled Labour	2 hours	1 hour	3 hours
Leather	$4m^2$	$2m^2$	$1m^2$
Glue	6 mg	2mg	1 m

Sure Step sells its type A shoe for GHC25, type B for GHC20 and type C for GHC15. During the coming week, Sure Step can purchase up to 400 hours of skilled labour, 600 m^2 of leather and 1,200 mg of glue.

Market constraints are such that it is impossible to sell more than 100 type A shoes.

Sure Step wants to maximize revenue but does not want to keep any shoes in inventory at the end of the week.

(a) Formulate Sure Step Company's production plan as a linear programming model using the following as decision variables:

X_1 = Number of type A shoes produced
X_2 = Number of type B shoes produced
X_3 = Number of type C shoes produced

(***6 marks***)

(b) Construct an initial simplex tableau for your model in (a) above using

S_1 as slack for skilled labour
S_2 as slack for leather
S_3 as slack for glue
S_4 as slack for demand for type A shoes

(***4 marks***)

(c) By how much will the total revenue increase in the first iteration?

(***5 marks***)

(d) Below is the final Simplex tableau for Sure Step production plan.

Basis	X_1	X_2	X_3	S_1	S_2	S_3	S_4	Constant
	0	0	1	0.4	-0.5	0	0	40
	0	1	0	-0.2	0.5	0	-2	80
	0	0	0	0	-1	1	-2	400
	1	0	0	0	0	0	1	100
Ƶ	0	0	0	2	10	0	25	4900

From the final simplex tableau, determine:

(i) the optimal production-mix

(***3 marks***)

(ii) the maximum total revenue

(***1 mark)***

(iii) the shadow price of skilled labour.

(***1 mark***)

(**Total: 20 marks**)

QUESTION 4

(a) Define time series and give **two (2)** examples

(***3 marks***)

(b) Sketch a historigram that represents a multiplicative time series model.

(***2 marks***)

(c) The sales figure of a firm appears to vary with the days of the week. Sales (in GHS'00) over the last three weeks are as follows:

	Days				
Week	Monday	Tuesday	Wednesday	Thursday	Friday
1	20	19	18	19	17
2	19	20	21	20	25
3	30	40	50	65	70

Required:

(i) Use the least square method to determine the trend line of sales figures for this firm.

(***7 marks***)

(ii) By using the multiplication model and the results in (i) above, forecast the daily sales figures for next week. (***8 marks***)

(**Total: 20 marks**)

QUESTION 5

DOO JACK CO. LTD is a manufacturing company that produces pens for the local market.

The total cost function for the production of the pens is given by:
$C = X^2 + 16_x + 39$, where x is in thousands of units produced and C the total cost in Ghana cedis.

The demand function for pens in the local market is given by:
$P = X^2 - 24_x + 117$, where x is in thousands of units demanded and P is the price in Ghana cedis.

Required:

(i) Derive an expression in x for the average cost. (***2 marks***)

(ii) Derive an expression in x for the marginal cost. (***2 marks***)

(iii) Derive an expression in x for the total revenue. (***2 marks***)

(iv) Derive an expression in x for the marginal revenue. (***2 marks***)

(v) Using a graph sheet provided, sketch the average cost, marginal cost, marginal revenue functions on the same sheet for values of x between 0 and 10. (***6 marks***)

(vi) If elasticity of demand is defined as $\frac{P}{x} .1/\frac{dP}{dx}$,
Determine the elasticity of demand for the quantity which maximizes the total revenue. (***3 marks***)

(vii) Determine the elasticity of demand for the quantity which maximizes profit. (***3 marks***)

(**Total: 20 marks**)

QUESTION 6

(a) Write short notes on the following:

(i) Random Sampling (***2 marks***)

(ii) Quota Sampling (***2 marks***)

(iii) Systematic Sampling (***2 marks***)

(b) The data below are yields ion kilograms from a random sample of 50 orange trees in an orchard.

40	25	47	52	12	36	43	54	46	36
30	40	21	37	38	28	33	33	24	47
38	27	51	43	35	57	57	29	49	64
24	35	23	30	41	42	22	37	35	15
46	29	33	18	32	34	59	43	28	30

Required:

(i) Using a class intervals of 10 – 4, 15 – 19, 20 – 24 … construct a frequency distribution table of the 50 observations. (***2 marks***)

(ii) Construct a cumulative frequency polygon of the frequency distribution in (i) above. (***3 marks***)

(iii) Calculate the mean of the frequency distribution in (i) above. (***3 marks***)

(iv) Calculate the standard deviation of the frequency distributions in (i) above. (***3 marks)***

(v) Use the cumulative frequency polygon in (ii) above to estimate the percentage of trees which lie within one standard deviation of the mean. (***3 marks***)

(**Total: 20 marks**)

QUESTION 7

(a) In Tanagra Company Limited, the probability that a worker comes late to work in any given day is 0.08. Out of 500 workers in Tanagra, 350 are females.

Determine the probability that a worker of Tanagra selected at random is a male late comer. (***5 marks***)

(b) A company manufactures three products A, B, C. Its production expenses are divided into three categories; Raw Material, Labour and Overheads.

To produce 1 unit of product A, GHC100, GHS300 and GHC100 are spent on raw materials, labour and overheads respectively. Also to produce 1 unit of product B, GHC300, GHC400 and GHC200 are spent respectively on raw materials, labour and overheads. Similarly, 1 unit of product C requires GHC150, GHC250 and GHC150 expenditure on raw materials, labour and overheads respectively.
Estimates of quarterly production are shown in the table below:

	Quarterly Production			
Production	Quarter 1	Quarter 2	Quarter 3	Quarter 3
A	4000	4500	4500	4000
B	2000	2600	2400	2200
C	5800	6200	6000	6000

The company would like to present at their shareholders meeting a single table showing the total costs for each quarter in each of the three categories.

Use matrices to prepare this single table for the company's shareholders meeting. (***15 marks***)

(**Total: 20 marks**)