



**CERTIFIED PUBLIC ACCOUNTANT
FOUNDATION LEVEL 1 EXAMINATION
F1.1: BUSINESS MATHEMATICS AND
QUANTITATIVE METHODS**

DATE: THURSDAY 29, FEBRUARY 2024

INSTRUCTIONS:

1. **Time allowed: 3 hours 15 minutes** (15 minutes reading and 3 hours writing).
2. This examination has **seven questions** and only **five questions** are to be attempted.
3. Marks allocated to each question are shown at the end of the question.
4. Show all your workings, where applicable.
5. The question paper should not be taken out of the examination room

QUESTION ONE

Buryohe Company Limited (BCL) deals in the production of beverages. The management of BCL is considering adding one more juice product in their product line. These are Ineza Juice, Kera Juice, and Kabuto Juice. The management is in a dilemma of choosing one among the three products that it wants to produce. BCL is expecting to produce these products under high, moderate, and low demand conditions. The estimated profits/losses in Rwandan Francs under the three demand conditions are provided in the table below:

Table 1: Shows the estimated profits/losses under various economic conditions

Products	Demand Conditions (FRW)		
	High Demand	Moderate Demand	Low Demand
Ineza Juice	40,000,000	70,000,000	20,000,000
Kera Juice	50,000,000	30,000,000	10,000,000
Kabuto Juice	45,000,000	35,000,000	(15,000,000)

The probabilities of each of the demand conditions were estimated as follows:

Table 2: Shows the probabilities under various economic conditions

Products	Demand Conditions		
	High Demand	Moderate Demand	Low Demand
Ineza Juice	0.40	0.50	0.10
Kera Juice	0.60	0.30	0.10
Kabuto Juice	0.50	0.30	0.20

Required:

(a) Determine the product to manufacture using the following criteria:

- (i) Maximax criterion (2 Marks)
- (ii) Minimax criterion (7 Marks)
- (iii) Hurwicz criterion (Alpha = 0.6) (4 Marks)

(b) Advise the management on a product to choose based on Expected Monetary Value (EMV) (4 Marks)

(c) Determine the expected value of perfect information from the information provided above. (3 Marks)

(Total: 20 Marks)

QUESTION TWO

Girinzu Company Limited deals in the construction of affordable houses in the City of Kigali. You are hired as the Project Manager to design the plan for construction, one of the affordable houses in the Kanombe Sector before December 2024. The table below shows the breakdown of ten activities with their respective durations in weeks.

Table 3: Shows project activities with their durations

Activity	Description	Predecessor	Duration (weeks)
A	View of the site	-	1
B	Preparation of the design	-	3
C	Raising funds for construction	A	4
D	Selection of the contractor	A	2
E	Getting the government approval	A	3
F	Laying the foundation	E	3
G	Starting and completing the construction project	D, F	5
H	Advertising in newspapers	B, C	3
I	Sale of the house to the client	G, H	4
J	Making some repairs and adjustments	I	2

Required:

- Draw the network diagram of the project from the information provided in the table above. (5 Marks)
- Find the critical path and the project duration. (2 Marks)
- Calculate the total float for activities B, C, D, and H from the information provided above. (5 Marks)
- Explain four rules that should be followed when drawing a network diagram for a project. (4 Marks)
- Explain to Girinzu Company Limited four advantages of network analysis in project management. (4 Marks)

(Total: 20 Marks)

QUESTION THREE

ICPAR wanted to know how students passed CPA quantitative papers. A tracer study was then conducted from a random sample of 50 students who had done Business Mathematics and Quantitative Methods in the recent years. The study was done to investigate the number of times students had sat for this paper. Out of the 50 students who were asked, 10 students had not repeated the paper, 12 had repeated it once, 10 had repeated it twice, 8 had repeated it three times, 6 had repeated it four times and 4 had repeated it five times.

Required:

- (a) Present the information provided above in a probability distribution table for each paper. (8 Marks)
 - (b) Calculate the expected value of the number of times a student had repeated Business Mathematics and Quantitative Methods. (3 Marks)
 - (c) Calculate the variance in the number of times students had repeated Business Mathematics and Quantitative Methods. (4 Marks)
 - (d) Calculate the standard deviation in the number times students had sat for the same paper. (2 Marks)
 - (e) State three assumptions of a binomial probability distribution. (3 Marks)
- (Total: 20 Marks)**

QUESTION FOUR

(a) The following data relates to a survey conducted about the production of coffee (in thousand tons) in the Western Province for the last three years. The table below shows the coffee production from 2021 to 2023.

Table 4: Shows coffee production in thousand tons from 2021 to 2023 for the Western Province

Year	Quarter	Coffee Production (thousand tons)
2021	1	97
	2	125
	3	137
	4	113
2022	1	104
	2	136
	3	147
	4	129
2023	1	116
	2	132
	3	145
	4	125

Required:

- (i) Explain what is meant by “time series decomposition” as used in time series analysis (1 Mark)
 - (ii) Show how the trend component can be decomposed in a time series equation under the multiplicative model. (1 Mark)
 - (iii) Using multiplicative model, calculate the four centered moving average trend values of the coffee production from 2021 to 2023. (8 Marks)
- (b) Statistics is a distinct mathematical science which is the study of the methods that are used in the collection, classification, organization, presentation, analysis and interpretation of qualitative and quantitative data.

Required:

- (i) Discuss the two main branches of statistics. (4 Marks)
 - (ii) Explain three applications of statistics in business. (6 Marks)
- (Total: 20 Marks)**

QUESTION FIVE

- (a) Discuss three decision making environments in which decision can be made for business decision makers. (6 Marks)
- (b) State two advantages of decision trees in decision theory. (2 Marks)

(c) In an attempt to satisfy the demand for his product, Mr. Kamanzi is considering three courses of action to develop the product. He is contemplating taking one of them which are construct a new plant, arrange for sub-contracting, and start an overtime production. The choice will be based on the demand in future that may be high, medium or low whose probabilities will be 0.20, 0.30 and 0.50 respectively. A recent market survey conducted reveals the expected profits and losses (in Rwandan Francs) shown in the table below;

Table 5: Shows the estimated profits/losses for various demand conditions

Demand	Alternative Courses of action			Probability
	Construct a new plant	Sub - contract	Start overtime production	
High	40,000,000	20,000,000	10,000,000	0.50
Moderate	15,000,000	20,000,000	60,000,000	0.30
Low	(35,000,000)	1,000,000	(2,000,000)	0.20

Required:

Use a decision tree to analyse the problem for Mr. Kamanzi and advise on the product to develop. (12 Marks)

(Total: 20 Marks)

QUESTION SIX

Best Seat Company (BSC), is a small company that manufactures office chairs that has established a reputation in Kigali City for more than a decade. Owing to the increasing demand for its products from customers in the region, BSC has focused on manufacturing a single product that has a variety of features that attract the customers. BSC plans to analyse its production and the sales for the following month. The table below shows the financial data for BSC entailing the costs and selling price structure which are expected to be constant all through the accounting period;

Table 6: Shows the costs and the selling price per unit for BSC's product

	FRW/unit	FRW/unit
Selling price		320
Direct materials	84	
Direct labour	80	
Variable overhead	36	
Fixed overhead	24	

The company is expected to produce 4,000 units per month. Assume that the fixed overhead absorption rate is based on the normal capacity of the company. Assuming the selling price per unit and the variable cost per unit are constant. Budgeted sales units for the next month are estimated to be 4,400 units.

Required:

- (a) Calculate the break – even units and the break – even sales value for the next month. (6 Marks)
 - (b) Explain the term margin of safety. (1 Mark)
 - (c) Calculate the margin of safety in units and in percentage of BSC for the next month. (4 Marks)
 - (d) Calculate the sales units required to achieve the target profit of FRW 564,000 in the next month. (3 Marks)
 - (e) Assuming that direct material cost per unit increases by 6 % and direct labour cost per unit increases by 5%, calculate the sales units required to achieve a profit of FRW 480,000. Assuming fixed overhead costs and the selling price per unit remain constant. (4 Marks)
 - (f) State two assumptions of break – even analysis. (2 Marks)
- (Total: 20 Marks)**

QUESTION SEVEN

The Rights of Employees Agency (REA) conducted a survey to determine the minimum wage rate for the employees of five private companies in Rwanda. A random sample of 60 employees was taken from the companies and their monthly salaries are provided in the table below in Rwandan Francs.

Table 7: Shows the monthly salary of employees in thousand Rwandan Francs

280	200	390	510	315	270	365	450	320	370
450	190	280	420	300	310	280	260	340	180
380	260	410	390	150	420	240	320	230	590
320	330	400	560	260	350	600	400	220	250
300	230	120	450	280	550	300	670	290	370
260	350	440	360	380	460	380	100	180	300

Required:

- Construct a frequency distribution table showing the classes, frequencies and class boundaries for this data starting with the interval 100 – 199. (9 Marks)
- Draw a histogram from data provided in the frequency distribution table constructed in (i) above. (9 Marks)
- Explain what is meant by a frequency polygon and state one circumstance in which a frequency polygon can be used in place of a histogram. (2 Marks)

(Total: 20 Marks)

End of question paper

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