

CERTIFIED PUBLIC ACCOUNTANT

FOUNDATION 1 EXAMINATION

**F1.1: BUSINESS MATHEMATICS AND QUANTITATIVE
METHODS**

WEDNESDAY: 5 DECEMBER 2012

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.

Attempt any five questions.

QUESTION ONE

A construction project consists of the activities shown below:

Activities	Time (days)		
	Optimistic	Most likely	Pessimistic
1 - 3	4	6	10
1 - 3	3	5	9
2 - 4	7	12	20
2 - 5	3	5	8
3 - 4	6	11	15
4 - 5	4	6	11
4 - 6	3	9	14
5 - 6	2	4	8
6 - 7	3	5	9

Required:

- (a) Compute the expected time and variance of each activity. **(8 marks)**
 - (b) Draw the project network for the activities. **(5 marks)**
 - (c) Determine the expected completion time and variance of the project. **(3 marks)**
 - (d) If the project is completed in less than 30 days, it will cost Frw 2 million. It will cost Frw 3 million if the project is completed between 30 and 35 days and Frw 5 million if it takes more than 35 days. Compute the expected cost of the project. **(4 marks)**
- (Total 20 marks)**

QUESTION TWO

- a) Explain the difference between additive and multiplicative models in time series. **(3 marks)**
- (b) The following represents the export data for tea.

Year	Quarter			
	1	2	3	4
	Frw, billion	Frw, billion	Frw, billion	Frw, billion
2007	8.9	10	7.5	11.8
2008	9.5	12.2	8.8	13.6
2009	10.4	13.5	9.7	13.1
2010	9.5	11.7	8.4	12.9
2011	10.9	13.7	10	15.1

Required:

- (i) Trend values using 4-point moving averages. **(8 marks)**
- (ii) Adjusted Seasonal indices for each quarter. **(6 marks)**
- (iii) Deseasonalised data set for year 2007 **(3 marks)**

(Total 20 marks)

QUESTION THREE

- a) What are the limitations of linear programming? (5marks)
- b) Amahoro Industries produces two products (A and B) that are sold as raw materials to companies that manufacture sweets. Based on analysis of current inventory levels and potential demand for the coming month, the production manager of Amahoro has specified that the total production for products **A** and **B** combined must at least be 350 kgs. Also, a major customer's order for 125 kgs of product **A** must be satisfied. Product **A** requires 120 minutes of processing time per kg and product **B** requires 60 minutes of processing time per kg for the coming month, a total of 600 hours are available for producing the two products. Production costs are Frw 2 per kg of product **A** and Frw 3 per kg of product **B**.

Required:

- i. Determine the production quantities that will satisfy the requirements above at minimum costs. (7 marks)
- ii. What is the minimum production cost? (3 marks)
- iii. Identify the products produced in excess of the above conditions. (5 marks)
- (Total 20 marks)

QUESTION FOUR

- a) Explain the terms explained and unexplained variations in the analysis of whether two or more variables are correlated. (5 marks)
- b) A study was conducted by a retailing company to determine the relation between its weekly advertising cost and sale. The data below was recorded:

Advertising costs (Frw)	Sales (Frw)
40	385
20	400
25	395
20	365
30	475
50	440
40	490
20	420
50	560
40	525
25	480
50	510

Required:

- i) Find the equation of the regression line to predict weekly sales from advertising costs using the least square method. **(8 marks)**
 - ii) Estimate the weekly sales when advertising costs are Frw 35. **(2 marks)**
 - iii) Calculate the coefficient of determination and the correlation coefficient and comment on the relationship between advertising costs and sales. **(5 marks)**
- (Total 20 marks)**

QUESTION FIVE

- a) Determine the best measure of location to use in each of the following circumstances:
 - i) To find the average rate of increase in salary of an employee over a period of 5 years. **(2 marks)**
 - ii) To determine the overall speed of travelling from town A to town B if the average speed for the first 100 kilometers was 80 kilometers per hour and for the remaining 50 kilometers was 60 kilometers per hour. **(2 marks)**
 - iii) To establish a typical wage to be used by an employer for wage negotiations for a small company with 500 employees where some employees are very highly paid. **(2 marks)**
 - iv) To determine the profit share for each partner if the agreement requires that profits are shared equally. **(2 marks)**
 - v) To ascertain the mean age of all students when it is known that the mean age for diploma students is 20 years while for degree students the mean age is 25 years. **(2 marks)**
 - iv) The mean monthly salary paid to all employees of a company is Frw 16,000. The mean monthly salary paid to skilled and unskilled employees is Frw 18,000 and Frw 12,000 respectively. Determine the percentage of skilled to unskilled employees. **(10 marks)**
- (Total 20 marks)**

QUESTION SIX

- a) A manufacturer makes two products **Q** and **M**. The cost of making **15 units** of product **Q** and **10 units** of product **M** is Frw, 600. The cost of making **5 units** of product **Q** and 8 units of product **M** is Frw, 340. The manufacturer makes a profit of 20% and 25% on cost of each unit of product **Q** and **M** respectively.

Required:

- i) Express the cost of making one unit of product **Q** and **M** in the form of simultaneous equations. **(1 mark)**

- ii) Calculate the cost of making one unit of product **Q** and product **M**. **(2 marks)**
- iii) Calculate the selling price of one unit of product **Q** and product **M**. **(1 mark)**
- b) A firm works a nominal **38 hour** week but with overtime and short time its actual working week varies by as much as 1 hour from the nominal figure. The firm produces 50 (± 2) articles per hour. The production cost and selling price are **Frw.20** and 30 per unit respectively, rounded to the nearest 10. Assume all production is sold.
- Calculate the range of:**
- i) Production per week. **(4 marks)**
- ii) Weekly production costs. **(4 marks)**
- iii) Weekly revenue. **(4 marks)**
- iv) Weekly profit. **(4 marks)**
- (Total 20 marks)**

QUESTION SEVEN

- a) Define the following terms as used in probability theory:
- i) Joint probability. **(1 mark)**
- ii) Marginal probability. **(1 mark)**
- iii) Conditional probability. **(1 mark)**

- b) The personnel department of a company has the following records of its 1,000 employees:

Age (years)	Diploma holder	Degree holder	Total
Under 30	450	50	500
30 to 40	100	150	250
Over 40	200	50	250
Total	750	250	1,000

If an employee is selected at random from the company what is the probability that he is:

- i) A diploma holder? **(1 mark)**
- ii) A degree holder given that he is over 40 years? **(2 marks)**
- iii) Under 30 years given that he is a diploma holder? **(2 marks)**
- c) An ice cream sales person divides his days as sunny, cloudy or cold. He estimates that the probability of a sunny day is 0.2 and that 0.3 of his days are cold. He has also calculated that his average revenue on the three types of days is Rwandan francs 220, 130 and 40 respectively. If his average total costs per day are Rwandan francs 80, calculate his expected profit per day. **(5 marks)**

- d) The probabilities that **three** different accountants will make a posting error are 0.1, 0.2 and 0.3 respectively each day.

Calculate the probability of:

- i) At least **one** was posting error on a particular day.

(3 marks)

- ii) Only **one** accountant will commit a posting error on a particular day.

(4 marks)

(Total 20 marks)

End of question paper