UGANDA MARTYRS UNIVERSITY

FACULTY OF BUSINESS ADMINISTRATION AND MANAGEMENT

DEPARTMENT OF ACCOUNTING AND FINANCE

COURSE: **QUANTITATIVE TECHNIQUES IN BUSINESS MANAGEMENT**

Course code: **MBA 1105**

Level of course: **MASTERS IN BUSINESS ADMINISTRATION AND MANAGEMENT (MBA PT LUBAGA, MASAKA, MBALE)**

DATE: **23rd APRIL 2022**

Time allowed: **3 hours:**

Instructions to Candidates:

Read the following before answering the examination questions.

1) Do not write anything on this question paper.
2) This paper has two sections A and B. Attempt any three(3) questions from section A and any two(2) questions from section B.
3) If you are sitting Quantitative Analysis as a Supplementary exam or a retake, then attempt five(5) questions in section A only.

SECTION A: *QUANTITATIVE ANALYSIS / QUANTITATIVE TECHNIQUES*

(Attempt any three(3) questions from this section)

Question One

The data below shows the annual revenues generated by sampled Micro enterprises in Gulu city in millions of shillings.

6.8	7.0	6.1	8.2	5.4	5.1	7.4	6.4	4.5	8.4
7.7	8.0	5.2	6.2	6.3	7.0	6.9	5.5	6.8	6.6
6.0	6.0	8.8	6.7	8.4	8.7	7.7	6.6	6.9	6.1
4.7	8.5	6.6	9.4	5.7	7.1	5.8	8.7	7.8	6.4
7.1	7.2	5.0	5.7	9.5	8.8	6.4	7.0	7.3	5.6

a) Develop a frequency table for the data **(06 marks)**

b) Using the frequency table; Calculate and make interpretations for;

i. The mean **(05 marks)**

ii. The Standard deviation **(05 marks)**

iii. The coefficient of variation **(04 marks)**

Question two

a) If correlation coefficient is the index to measure the degree of correlation, explain how you would use the different correlation ships of variables with relevant illustrations **(03 marks)**

b) To determine the consistency in pricing of commodities in markets in Kampala, two market surveys were carried out and the following prices were obtained from nakawa market and compared to nakasero market.

Commodity	Flour	Cooking Oil	Tomatoes	Matooke	Eggs	Milk	Bananas	Fish	Sugar	Chicken
Nakawa	7500	8900	3400	14000	10800	9000	5800	15000	3700	9000
Nakasero	7000	7900	5800	17000	12400	9500	6800	20,000	4000	8600

i. Draw a scatter plot **(03 marks)**

ii. Compute a correlation coefficient (r) for the two markets and what conclusions do you draw from the two markets (**05 marks)**

iii. Determine and explain the effect of the variations in the pricing of commodities to a customer's purchasing decision from the two markets **(09 marks)**

Question three

(a) A metal fabricator manufactures two types of windows. Each of the windows needs two processes. The time taken on various machines differ due to the size of windows. The time taken and available hours are given in the table below: The profit contribution for windows A and B are shs. 60.000 and shs. 40.000

Window type	Cutting machine	Grinding machine	Total time
A	2 hours	3 hours	120 hours
B	2 hours	1 hour	60 hours

(i) Formulate the problem. **(4 marks)**

(ii) Solve the problem using simplex method to maximize the profit. **(10 marks)**

(iii) Determine the excess time available in each process and by how much; Use the values to and interpret the efficiency implications to the metal fabricator **(06 marks)**

Question four

a) According to the sales manager , the probability that 6 weekly advertisements for a new product have to be carried in order to ensure 80% sales

As the Finance manager due to budget constraints, find the probability that

i. Only one advert is enough **(02 marks)**

ii. More than two advertisements are required **(02 marks)**

b) UMEME has estimated that daily electricity power consumption at Namanve Industrial park is normally distributed with a mean of 10,000kilowatts and a standard deviation of 2,000kilowatts. As an auditor, what will be the probability that the consumption of electricity on a given day is between 7,500 and 14,000 kilowatts **(03 marks)**

c) With relevant business and management examples/illustrations explain;

i. how to use a significance level in hypothesis test **(02 marks)**

ii. how relevant a one tail and two tail test is to a researcher **(02 marks)**

d) A manufacturer claims that his light bulbs have an average lifetime of 1500 hours. A purchaser decides to check this claim and finds that for six bulbs the life times are 1472, 1486, 1401, 1350, 1610, 1590 hours.

Does this evidence support at a significance level of 5%? **(09 marks)**

Question five

a) Find the best decision with the following gains matrix **(4 marks)**

	Event		
Alternative	Sale	Develop	Buy
	P=0.7	*P=0.2*	*P=0.1*
A	14	24	12
B	6	40	90
C	1	70	30
D	12	12	6

b) A business man asked his bank for a loan to expand his company. The bank managers have to decide whether or not to grant the loan. If they grant the loan, the businessman's expansion maybe successful or unsuccessful. if the bank managers don't grant the loan, the business man may continue banking as before or he may move to his account to another bank.

i) Draw a decision tree of this situation. **(5 marks)**

ii) Suppose the business man currently values his account at shs. 20,000,000. If the manager grants the loan and expansion succeeds, the value to the bank of increased business and interest charges will be shs. 30,000,000 a year. If the expansion does not succeed, the value to the bank declines to shs. 10,000,000 because of lower business volumes and allowance for write off of bad debt. There is a probability of 0.7 that the expansion plan will succeed. If the manager does not grant the loan there is a probability of 0.6 that the business man will transfer his account to another bank.

Analyse the problem tree for the business man **(11 marks)**

Question Six

A Company Marketing Manager is attempting to derive a sales-output relationship for the company. The following data has been collected for several products in the company.

Units of sales output	10	20	40	25	30	40	50	45
Cost of sale (Shs'000)	32	39	58	44	52	61	70	64

a) Using linear regression analysis, derive the relationship between the variables (sales units and cost of sales) and advise the marketing manager. **(10 marks)**

b) Determine error associated with the sales and cost estimates. **(04 marks)**

c) Estimate the strength of the relationship between the variables (sales units and cost of sales) **(6 marks)**

Question Seven

A consultant has decided to undertake some research to create a selling strategy for Start up business. The company operations manager has identified the activities A to I and their associated duration time (in weeks), and cost (in Shs '000') and schedule of implementation as given in the table below:

		Time (weeks)		Costs ('000 shillings)	
Activity	**Immediate Predecessor**	**Normal**	**Crash**	**Normal**	**Crash**
A	-	4	2	10,000	11,000
B	A	3	2	6,000	9,000
C	A	2	1	4,000	6,000
D	B	5	3	14,000	18,000
E	B, C	1	1	9,000	9,000
F	C	3	2	7,000	8,000
G	E, F	4	2	13,000	25,000
H	D, E	4	1	11,000	18,000
I	H, G	6	5	20,000	29,000

(a) Draw the project network using the activity on arrow **(03 marks)**

(b) Determine the critical path **(02 marks)**

(c) If a decision has been taken to expedite the project

(i) Determine the shortest time in which the project can be completed with least cost increment **(12 marks)**

(ii) What is the resulting percentage increase in budget? **(3 marks)**

SECTION B: OPERATIONS SERVICES MANAGEMENT(OSM)

(Attempt any two(2) questions from this section)

Question Eight

Mini Case Study: McDonald's in Russia

During the 1980s, McDonald's decided to open a facility in Moscow. McDonald's competitive strategy is low cost and conformance quality. In other words, McDonald's hamburgers taste the same anywhere you go in the world. In order to meet this goal of conformance quality and low cost, McDonald's was faced with several supply chain problems. Russia's road and rail network is extremely limited. Winston Churchill stated in the 1950s that there were no roads in Russia, only spaces between buildings. There was truth to that statement still in the 1980s. Thus, if McDonald's wanted to ship products into Moscow they would be forced to use air freight, which would not support their low cost strategy. In addition, they could not purchase the foodstuffs locally, because the wheat, beef, cheese and tomatoes (among others) did not meet their guidelines. Their final solution was to spend nearly ten years building their own local supply chain. They went outside Moscow and built a ranch and a farm. There they raised their own beef (so that the meat would taste the same), their own wheat (so that the bans would taste the same), and their own vegetables. In this fashion, their supply chain matched their competitive strategy.

Required:

(a) State the ideal mission statement for McDonald's in the above case.

(4 Marks)

(b) Explain the Strategy development process that McDonald's could have followed to arrive at the ideal strategies to employ in Moscow.

(6 Markd)

(c) Discuss the Supply Chains Strategies that were employed by McDonalds in order to succeed in Moscow. What are the challenges associated with the above supply chain strategies?

(10 marks)

Question Nine

(a) Discuss how Centenary bank can employ the following operations management alternatives in order to remain competitive in the financial services/ banking business in Uganda;

- Outsourcing and Benchmarking

(7 Marks)

- Web-enabled Services and Customer relationship management

(7 Marks)

- Centralized and Decentralized inventory management.

(6 Marks)

Question Ten

(a) Capacity planning is very important to all sizes and types of organisations and it is often among the first decisions that the company has to make. Capacity decisions affect product lead times, customer responsiveness, operating costs and the firm's ability to compete.

Required:

Discuss the strategies for coping with non-uniform demand in a service entity like Lubaga hospital which registers many patients daily for their health services like; Dental services, Paediatrics, Eye-care, Radiology, Maternity, Physiotherapy, Obstetrics, HIV support.

(6 Marks)

(b) Waiting- line models are useful in both manufacturing and service areas. Analysis of queues in terms of waiting-line length, average waiting time, and other factors help us understand service systems(such as bank teller stations), maintenance activities (might repair broken machinery), and shop-floor control activities.

Required:

With an illustration explain the trade-off that must take place between two costs that Operations managers recognize when analysing queuing costs. (6 Marks)

'(c) A certain manufacturing process requires a constant time of 1 minute to complete one unit. Units arrive at an average of 40 per hour. Assuming Poisson arrivals and exponential service times.

Required:

(i) Determine the average number of units waiting to be served.

(2 Marks)

(ii) Determine the average number of units in the system?

(2 marks)

(ii) Determine the length of time in minutes a unit must wait to be served.

(2 Marks)

(iv) What is the probability that the system is idle?

(2 Marks)

(v) The technician manning the manufacturing process is paid USD15 per hour, but because of lost goodwill and sales, the company looses about USD 35 per hour of a unit's waiting time to be processed. Assume an 8 hours day of work. Calculate the total daily costs incurred by this manufacturing process.

(2 Marks)

Table D.3 ■ Queuing Formulas for Model A: Simple System, also called M/M/1

λ = mean number of arrivals per time period

μ = mean number of people or items served per time period

L_s = average number of units (customers) in the system

$$= \frac{\lambda}{\mu - \lambda}$$

W_s = Average time a unit spends in the system (waiting time plus service time)

$$= \frac{1}{\mu - \lambda}$$

L_q = Average number of units in the queue

$$= \frac{\lambda^2}{\mu(\mu - \lambda)}$$

W_q = Average time a unit spends waiting in the queue

$$= \frac{\lambda}{\mu(\mu - \lambda)}$$

ρ = Utilization factor for the system

$$= \frac{\lambda}{\mu}$$

P_0 = Probability of 0 units in the system (that is, the service unit is idle)

$$= 1 - \frac{\lambda}{\mu}$$

$P_{n>k}$ = Probability of more than k units in the system, where n is the number of units in the system

$$= \left(\frac{\lambda}{\mu}\right)^{k+1}$$

TABLE D.4 ■ Queuing Formulas for Model B: Multichannel System, also Called M/M/S

M = number of channels open

λ = average arrival rate

μ = average service rate at each channel

The probability that there are zero people or units in the system is

$$P_0 = \frac{1}{\left[\sum_{n=0}^{M-1} \frac{1}{n!}\left(\frac{\lambda}{\mu}\right)^n\right] + \frac{1}{M!}\left(\frac{\lambda}{\mu}\right)^M \frac{M\mu}{M\mu - \lambda}} \quad \text{for } M\mu > \lambda$$

TABLE D.4 ■ *(continued)*

The average number of people or units in the system is

$$L_s = \frac{\lambda\mu(\lambda/\mu)^M}{(M-1)!(M\mu - \lambda)^2} P_0 + \frac{\lambda}{\mu}$$

The average time a unit spends in the waiting line or being serviced (namely, in the system) is

$$W_s = \frac{\mu(\lambda/\mu)^M}{(M-1)!(M\mu - \lambda)^2} P_0 + \frac{1}{\mu} = \frac{L_s}{\lambda}$$

The average number of people or units in line waiting for service is

$$L_q = L_s - \frac{\lambda}{\mu}$$

The average time a person or unit spends in the queue waiting for service is

$$W_q = W_s - \frac{1}{\mu} = \frac{L_q}{\lambda}$$

TABLE D.5 ■ Queuing Formulas for Model C: Constant Service, also Called M/D/1

Average length of queue: $L_q = \frac{\lambda^2}{2\mu(\mu - \lambda)}$

Average waiting time in queue: $W_q = \frac{\lambda}{2\mu(\mu - \lambda)}$

Average number of customers in system: $L_s = L_q + \frac{\lambda}{\mu}$

Average waiting time in system: $W_s = W_q + \frac{1}{\mu}$