KASNEB
CPA
QUANTITATIVE ANALYSIS

June 2012

QUESTION ONE

a) Bestserve Hotel has three departments namely; maintenance, laundry and kitchen. These departments serve the main operating department of the hotel.
The allocation of service cost among these service departments is as follows:

	Maintenance	Laundry	Kitchen
Maintenance	5%	25%	10%
Laundry	5%	15%	10%
Kitchen	10%	15%	5%

The direct costs allocated for the operations of each of the service departments are as shown below:

Service Department	Direct Cost (Sh.)
Maintenance	224,000
Laundry	1,000,000
Kitchen	140,000

Required:

i) Derive the equation for the total operating cost of each service department. (3marks)
ii) Write the equation in matrix form (1 mark)
iii) The total cost of operating each of the service departments. (6 marks)

b) A survey on car dealership in a country in 2011 revealed that 60 percent of cars were sold in the capital city while there rest were sold in other parts of the country. The probability of a customer buying a Toyota model was 0.6, a Nissan model 0.3 and any other vehicle model 0.1. Wealthier citizens prefred to buy brand new vehicles with a relativefrequency of 0.25. In the month of April 2012, a dealer sold one thousand vehicles.

Required:

i) Present the above information in form of a tree diagram. (4 marks)
ii) The number of brand new Toyotas or brand new models of other vehicles bought in April 2012. (2 marks)
iii) The number of Nissan vehicles bought that were not new. (2 marks)
iv) The number of second hand vehicles bought in other parts of the country. (2 marks)

(Total: 20 marks)

QUESTION TWO

a) Distinguish between a "point estimator" and an "internal estimator" (4 marks)
b) Umbayo Limited manufactures a detergent known as "Safi soap". This detergent is put in containers whose volume is normally distributed with a mean of 5 litres and a standard deviation of 0.3 litres.
Additional information:

1. A container is classified as "light" when the volume is below 4.8 litres, "normal" when the volume is between 4.8 litres and 5.1 litres and "heavy" if the volume is more than 5.1 litres.
2. A light container sells at Sh. 930 while a normal and a heavy container sell at Sh. 1,000 and Sh. 1,100 respectively.

Required:
The amount the customer, has ordered a consignment of 500 containers of the detergent. (6 marks)

c) A researcher has developed an index to measure the extent of retaliation against a whistle blower. The retaliation is based on the following:

1. The number of forms of reprisal actually experienced
2. The forms of reprisal threatened.
3. The number of people within an organization who retaliated against them in a public agency.

The table below shows the retaliation index and salary for a sample of 15 whistle blowers from public agencies.

Retaliation index	301	550	755	327	500	377	290	452
Salary (Sh. '000')	62	36.5	21.6	24	30.01	35	47.5	54

Retaliation index	535	455	615	700	650	630	360
Salary (Sh. '000')	19.8	44	46.6	15.1	70	21	16.9

Additional information:

Ey^2=4,061,063

Required:

i) Use the method of least squares to find a regression line of retaliation index against whistle blower's salary. (5 marks)

ii) Predict the retaliation index for a whistle blower earning Sh. 45,000. (1 mark)

iii) Find a 95% confidence interval for a whistle blower in (c) (ii) above. (3 marks)

(Total: 20 marks)

QUESTION THREE

a) Outline five requirements that should be met in order to apply the linear programming model. (5 marks)

b) A manufacturing company is proposing to introduce to the market a banking security system. There are three possible models X, Y and Z varying in application and durability. The company has the capacity in terms of human resources and machinery to manufacture only one model. An analysis of the possible market demand of the models has been carried out with the following estimated profits:

Market demand	**Probability of market demand**	**Model profits (Sh. " million")**		
		X	**Y**	**Z**
High	0.35	70	120	140
Medium	0.4	55	80	80
Low	0.25	40	20	-20

The board of directors has sought advice from the company's finance director who has estimated the utilities for various sums of money from (Sh. 20,000,000) to Sh. 140,000,000 as follows:

Monetary value (Sh. "million")	-20	0	20	40	55	60	70
Utility	0	0.2	0.37	0.52	X	0.65	Y

Monetary value (Sh. "million")	80	100	120	140
Utility	0.78	0.89	0.96	1

Required:

i) Determine the model to market based on the maximum expected profit criterion. (3marks)
ii) Determine the model to market based on the maximin criterion rule. (2 marks)
iii) Calculate the value of perfect information on market demand. (2 marks)
iv) Compare your advice based on expected utility with your advice in (i) and (ii) above. (4marks)

(Total: 20 marks)

QUESTION FOUR:

a) Discuss three limitations of the economic order quantity (EOQ). (6 marks)
b) The following data relates to a product Que; the main raw material of Olivya Company Limited:

Annual demand 300,000 units
Opportunity cost of capital 20%
Annual working days 300
Usage demand Constant during the year

Product Que is sourced from two suppliers with the following terms:
Supplier A: Supplies orders in any quantity at cost of Sh. 80 plus a fixed delivery cost of Sh. 6,000 per order
Supplier B: Supplies orders at a cost of Sh. 79.50 with no delivery charges but only delivers in lots of 60,000 or more.

Required:
i) The minimum total annual cost for each of the suppliers; A and B. (7 marks)
ii) The frequency of orders in working days for each of the suppliers; A and B. (4 marks)
iii) Supplier A has faced market restrictions and can only supply 250,000 units of Que to Olivya Company Limited. Calculate the additional cost associated to Olivya Company. (3 marks)

(Total: 20 marks)

QUESTION FIVE

a) State four practical limitations of the queuing model. (4 marks)
b) A project comprise A to **H.** the following information is provided for this project:
Precedence relationships:

- A and B are first activities of the project.
- C succeeds A while B precedes D. Both C and D precede E and **F.** activity G follows activity **F** while **H** is the last activity of the project and succeeds E and G.

The activity times and probabilities are as follows:

Activity	**Duration (days) and probabilities**					
	1	**2**	**3**	**4**	**5**	**6**
A		0.2	0.4	0.4		
B				0.3		0.7
C			0.3	0.3	0.4	
D		0.2	0.6		0.2	
E				0.6	0.4	
F		0.8	0.2			
G	0.3		0.5	0.2		
H		0.1	0.2	0.3	0.4	

Required:

i) Simulate the project and determine the activity times using the random numbers given below:

22,19,16,78,03,93,78,23,17,36,77,43,28,22,76,68 (9 marks)

ii) The critical path and the project's expected completion time (7 marks)

(Total: 20 marks)