STRATHMORE BUSINESS SCHOOL

MASTER OF SCIENCE IN DEVELOPMENT FINANCE

END OF SEMESTER EXAMINATION

MDF 8103 : QUANTITATIVE TECHNIQUES IN DEVELOPMENT FINANCE

Date: Thursday, 7th January 2021 **Time**: 3 Hours

Instructions

1. This examination consists of SIX questions. Answer **ANY THREE** questions.
2. You are expected to work independently
3. Marks may be awarded for neatness of work
4. Candidates may use QM for Windows software in answering questions
5. This formular may be useful from

$$\hat{y} = b_0 + b_1 x$$

$$b_1 = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

$$b_0 = \frac{\sum y}{n} - b_1 \frac{\sum x}{n}$$

Question 1 (20 Marks)

(a) Explain the differences between:

i) Decision making under certainty **(2 marks)**

ii) Decision making under uncertainty and **(2 marks)**

iii) Decision making under risk. **(2 marks)**

(b) Elite Publications Limited wishes to choose the location for a new publishing house. Profits obtained will depend on whether a university is built in the town in which the new publishing house will be located. The following payoff table summarizes the relevant information:

Alternatives	New University Built (KSh '000,000')	No University Built (KSh '000,000')
Location A	14	1
Location B	10	2
Location C	6	4

Determine the location that should be chosen if the firm uses,

i) the maximax criterion **(2 marks)**

ii) the maximin criterion **(2 marks)**

iii) the min-max regret criterion **(3 marks)**

(c) Using probability 0.60 for a new university and 0.40 for no new university:

i) Compute the expected monetary value for each location **(3 marks)**

ii) Find the location that should be selected using the expected monetary value criterion**.** **(1 mark)**

iii) Compute the EVPI, expected value of perfect information. **(3 marks)**

Question 2 (20 Marks)

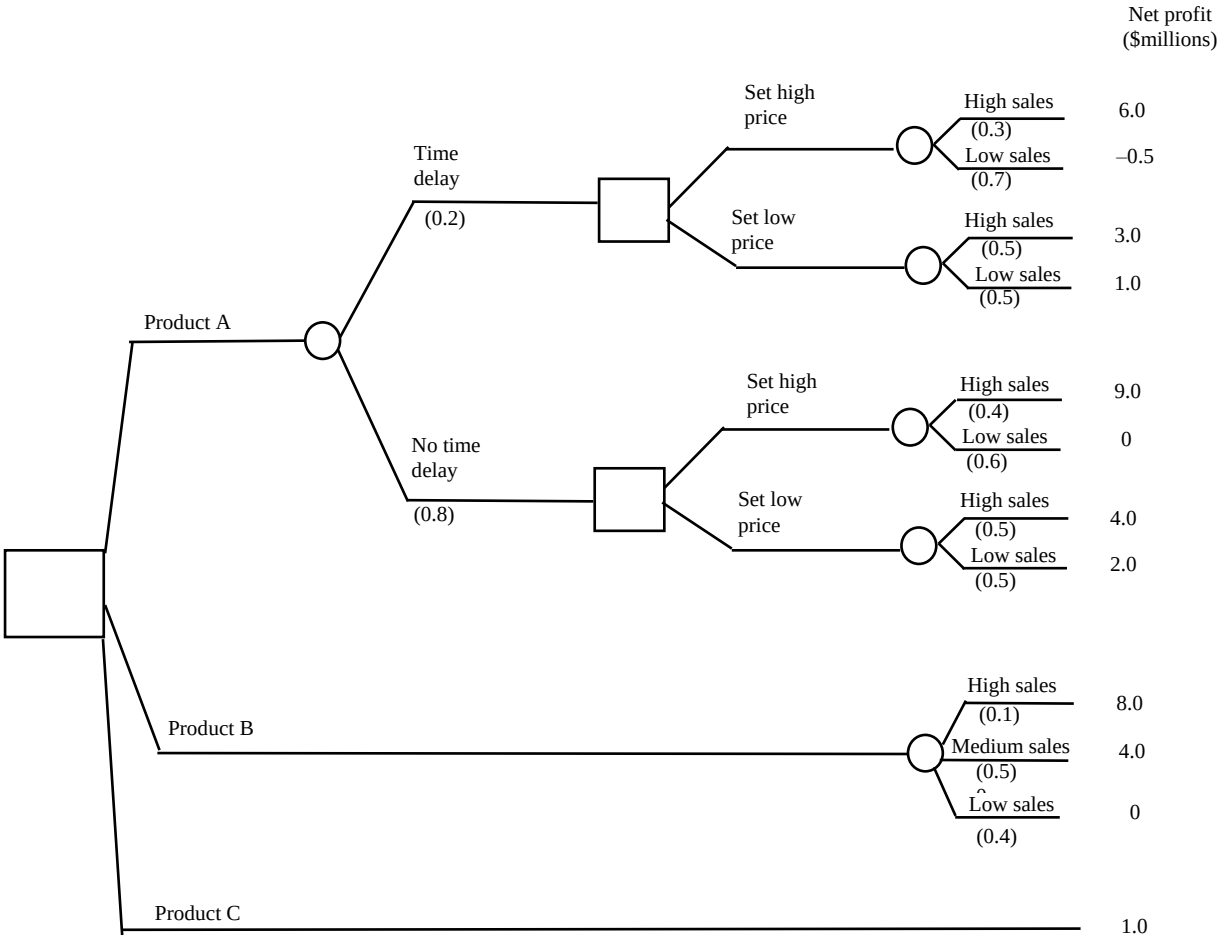
(a) Explain under what conditions would one prefer a **Decision Tree** approach to a **payoff** table to facilitate decision making. **(3 marks)**

(b) Briefly explain the steps used in developing a **Decision Tree**. **(5 marks)**

(c) The Elite Ugali Company (EUC) must decide which of the three products to introduce. Because of shortage of working capital, only one can be introduced. The marketing manager drew up the decision tree shown below. Suppose you accept this tree as a reasonable representation of EUC's decision problem, and that EUC is willing to use EMV as the decision criterion.

i) What is the optimal strategy for EUC **(10 marks)**

ii) What is the expected profit of this strategy? **(2 marks)**



Question 3 (20 Marks)

(a) What does regression analysis do? **(2 marks)**

(b) Explain what is meant by *Simple Linear Regression* and *Multiple Linear Regression* given an example in each case to support your explanation. ***(*2 marks)**

(c) A company has a fleet of vehicles and is trying to predict the annual maintenance costs per vehicle. The following data have been supplied for a sample of vehicles:

Vehicle No	Ages in Years (x)	Maintenance Cost per annum (y) (KSh '000')
1	2	60
2	8	132
3	6	100
4	8	120
5	10	150
6	4	84
7	4	90
8	2	68
9	6	104
10	10	140

Required:

i) Using the ***least squares*** techniques, calculate the values of *a* and *b* in the equation $y = a + bx$, to allow managers to ***forecast*** the likely maintenance cost, knowing the age of the vehicle. **(8 marks)**

ii) Prepare a table of maintenance costs covering vehicles from 1 to 10 years of age, based on your calculations in (i) **(5 marks)**

iii) Estimate the maintenance costs of a 12-year-old vehicle and comment on the validity of making such an estimate. **(3 marks)**

Question 4 (20 Marks)

The manager of the carpet city outlet needs to make an accurate forecast of the demand for soft Shag carpet (its biggest seller). If the manager does not order enough carpet from the carpet mill, customers will buy their carpet from one of Carpet City's many competitors. The manager has collected the following demand data for the past 8 months.

Months	Demand for Soft Shag Carpet (1,000 yd.)
1	8
2	12
3	7
4	9
5	15
6	11
7	10
8	12

a) Compute a 3-month moving average forecast for months 4 through 9. **(6 marks)**

b) Compute a weighted 3-month moving average forecast for months 4 through 9. Assign weights 0.55, 0.33, and 0.12 to the months in sequence, starting with the most recent month. **(9 marks)**

c) Compare the two forecasts by using MAD and determine which forecast appears to be more accurate? **(5 marks)**

Question 5 (20 Marks)

National Oil Company conducts exploratory oil drilling operations. In order to fund the operation, investors form partnerships, which provide the financial support necessary to drill a fixed number of oil wells. Each well drilled is classified as a producer well or a dry well. Past experience shows that this type of exploratory operation provides producer wells for 15% of wells drilled. A newly formed partnership has provided the financial support for drilling at 12 exploratory locations.

(a) What is the probability that all 12 wells will be producer wells? **(6 marks)**

(b) What is the probability that all 12 wells will be dry? **(4 marks)**

(c) What is the probability that exactly 1 well will be a producer well? **4 *marks***

(d) In order to make the partnership venture profitable, at least 3 of the 12 exploratory wells must be producer wells. What is the probability that the venture will be profitable? **(6 marks)**

Question 6 (20 Marks)

The time spent waiting between events is often modelled using the exponential distribution. For example, suppose that an average of 30 customers per hour arrive at a store and the time between arrivals is exponentially distributed.

(a) On average, how many minutes elapse between two successive arrivals? **2 *marks***

(b) When the store first opens, how long on average does it take for three customers to arrive? (**2 marks)**

After a customer arrives, find the probability that it takes less than one minute for the next customers to arrive. (**4 marks)**

After a customer arrives, find the probability that it takes more than five minutes for the next customer to arrive. (**4 marks)**

(c) Seventy percent of customers arrive within how many minutes of the previous customer.

(**5 marks)**

(d) Is an exponential distribution reasonable for this situation? (**3 marks)**