



**STRATHMORE UNIVERSITY BUSINESS SCHOOL**  
**BACHELOR OF SCIENCE IN SUPPLY CHAIN AND OPERATIONS MANAGEMENT**  
**END OF SEMESTER EXAMINATION**  
**SCM 3202: SUPPLY CHAIN MODELLING, OPTIMIZATION, SIMULATIONS AND**  
**GAMING**

**DATE: 18<sup>th</sup> December 2023**

**TIME: 15:30 – 17:30**

**Instructions**

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.
3. Marks may be awarded for neatness of work

**QUESTION 1**

- (a) Explain what is meant by a **game** in game theory **[5 marks]**
- (b) Explain the **Minimax** and **Maximin** principles used in the theory of games **[10 marks]**
- (c) A company management and the labour union are negotiating a new three-year settlement.

Each of these has 4 strategies:

**I Hard and aggressive bargaining**

**II Reasoning and logical approach**

**III: Legalistic strategy**

**IV: Conciliatory approach**

The cost to the company is given for every pair of strategy choices.

Union Strategies	Company Strat.I	Company Strat.II	Company Strat.III	Company Strat.
I	20	15	12	35
II	25	14	8	10
III	40	2	10	5
IV	-5	4	11	0

What strategy will the two sides adopt? Also, determine the value of the game. **[15 marks]**

## QUESTION 2

A textile firm employs three knitting machines to produce bedspreads. Forty percent of the firm's daily bedspread production comes from machine A, while the remainder of the production is split equally between machines B and C. One percent of the bedspreads produced on machine A is flawed, while the flaw rates for machines B and C are 2% and 3%, respectively. If one bedspread is selected randomly Page 2 of 4 from a day's production and is found to contain a flaw, what is the probability that it was produced on machine B? **[20 marks]**

## QUESTION 3

(a). The success or failure that an individual or organization experiences, depends, to a large extent, on the ability to make appropriate decisions. Making a decision requires an enumeration of feasible and viable alternatives (courses of action or strategies), the projection of consequences associated with different alternatives, and a measure of effectiveness (or an objective) to identify the best alternative to be used.

From the above preamble, explain the **Three** types of **decision-making environments**. **[3 marks]**

(b). When a new shopping center is built, the electric company must assign a transformer to the location. Since this is done before the occupants of the shopping center are known, there is uncertainty about the amount of electricity to be used (for example, beauty salons use more electricity than toy stores) and hence, uncertainty about the size of the transformer needed. A too-small transformer would have to be replaced, and one too-large would result in more expense than necessary. A table giving these costs in (1000s) of US dollars is shown below:

<i>Size of Transformer Originally Installed</i>			
<i>Amount of Electricity Ultimately needed</i>	<b>Small</b>	<b>Medium</b>	<b>Large</b>
Little	50	100	150
Medium	140	100	150
Much	190	190	150

Suppose, for a given shopping center, the following probabilities are assigned to the amount of electricity ultimately needed:

<i>Need</i>	<i>Probability</i>
Little	0.2
Medium	0.7
Much	0.1
	1.0

- Using the maximin criteria, what decision should be made? **[3 marks]**
- Draw up an opportunity loss table. **[5 marks]**
- What decision should be made? Why? **[2 marks]**
- What is the expected value of perfect information? **[5 marks]**
- Interpret your answer from (iii). **[2 marks]**

#### QUESTION 4

East Coasters Bicycle Shop in Nairobi wants to purchase and stock new mountain bikes and it is considering three models from different manufacturers – the Xandu Mark III, the Yellow Hawk Z9, and the Zodiak MB5. It has identified three criteria for selection – **purchase price, gear action, and weight/ durability**. They have developed the following pairwise comparison matrices for each of the three criteria.

<b>BIKE</b>	<b>PRICE</b>			<b>BIKE</b>	<b>GEAR ACTION</b>		
	<i>X</i>	<i>Y</i>	<i>Z</i>		<i>X</i>	<i>Y</i>	<i>Z</i>
X	1	3	6	X	1	1/3	1/7
Y	1/3	1	2	Y	3	1	1/4
Z	1/6	1/2	1	Z	7	4	1

  

<b>BIKE</b>	<b>WEIGHT/ DURABILITY</b>		
	<i>X</i>	<i>Y</i>	<i>Z</i>
X	1	3	1
Y	1/3	1	1/2
Z	1	2	1

The prioritized decision criteria according to the pairwise comparisons are:

CRITERIA	PRICE	GEARS	WEIGHT
Price	1	3	5
Gears	1/3	1	2
Weight	1/5	1/2	1

Using AHP, develop an overall ranking of the three bikes.

[20 marks]

### QUESTION 5

- (a) An essential aspect of managing any organization is planning for the future. Indeed, the long-run success of an organization is closely related to how well management is able to anticipate the future and develop appropriate strategies. Good judgement, intuition and an awareness of the state of the economy may give a manager a rough idea or ‘feeling’ of what is likely to happen in the future. Explain the importance of **Business Forecasting**.

[5 marks]

- (b) Consider the following time series data.

Week	1	2	3	4	5	6
Value	8	13	15	17	16	9

- i) Develop a three-week moving average for this time series. What is the forecast for week 7? [6 marks]
- ii) Compute the MSE for the three-week moving average. [3 marks]
- iii) Use  $\alpha = 0.2$  to compute the exponential smoothing values for the time series. What is the forecast for week 7? [4 marks]
- iv) Compare the three-week moving average forecast with the exponential smoothing forecast using  $\alpha = 0.2$ . Which appears to provide the better forecast? [2 marks]