UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

COURSE NAME	:	MANAGEMENT SCIENCE II
COURSE CODE	:	BPB 20603
PROGRAMME CODE	:	BPA
EXAMINATION DATE	:	JULY 2024
DURATION	:	3 HOURS
INSTRUCTION		1. ANSWER ALL QUESTIONS
		2. THIS FINAL EXAMINATION IS CONDUCTED VIA
		☐ Open book
		☒ Closed book
		3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

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Q1 Hudson Corporation is considering three options for managing its data processing operation. The first is continuing with its own staff. The second is hiring an outside vendor to do the managing (referred to as outsourcing) and the third is using a combination of its own staff and an outside vendor. The cost of the operation depends on future demand. **Table Q1** shows the annual cost of each option with respect to the demand condition:

Table Q1: Cost (RM'000) of each option with respect to the demand condition

Data Managing Option	Demand		
	High	Medium	Low
Own Staff	650	650	600
Outside Vendor	900	600	300
Combination	800	650	500

(a) Determine the decision to be made, and the chance event for the company.

(3 marks)

(b) Construct an influence diagram.

(4 marks)

(c) Construct a decision tree.

(4 marks)

(d) Recommend decision based on the use of:

(i) Optimistic approach

(ii) Conservative approach

(iii) Minimax regret approach

(9 marks)

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Q2   T. Bone Puckett, a corporate raider, has acquired a textile company and is contemplating the future of one of its major plants, located in South Carolina. Three alternative decisions are being considered. The first alternative decision is to expand the plant and produce lightweight, durable materials for possible sales to the military, a market with little foreign competition. The second alternative decision is to maintain the status quo at the plant, continuing production of textile goods that are subject to heavy foreign competition and the third alternative decision is to sell the plant now. If one the first two alternatives is chosen, the plant will still be sold at the end of a year. The amount of profit that could be earned by selling the plant in a year depends upon foreign market conditions, including the status of a trade embargo bill in Congress. **Table Q2** shows the payoff (profit in RM) for each decision situation.

Table Q2: Payoff table of T. Bone Puckett textile company

Decision Alternative	State of Nature	
	Good Foreign Competitive Conditions	Poor Foreign Competitive Conditions
Expand	800,000	500,000
Maintain status quo	1,300,000	-150,000
Sell now	320,000	320,000

Assume that a probability of 0.70 that good foreign competitive conditions will exist and a probability of 0.30 that poor conditions will exist.

T. Bone Puckett has hired a consulting firm to provide a report on future political and market situations. The report will be positive (S) or negative (N), indicating either a good (g) or poor (r) future foreign competitive situation. The following are the conditional probability of each report outcome, given each state of nature.

$$P(S \mid g) = 0.70 \qquad P(S \mid r) = 0.20$$
$$P(N \mid g) = 0.30 \qquad P(N \mid r) = 0.80$$

(a)   Compute the conditional probability of each state of nature, given each report outcome.

(10 marks)

(b)   Determine the optimal decision strategy, and the expected value of the decision strategy.

(10 marks)

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Q3   Sunrise Bakery has decided to bake 20 loaves of its famous sourdough bread every day. Each loaf costs Sunrise RM1.50 and can be sold for RM3.00. Sunrise can sell any unsold loaves for RM0.75 the next day. The store has determined that daily demand will follow the distribution as shown in **Table Q3(a)**:

Table Q3(a): Demand probability distribution

Daily Demand	Probability
5	0.08
10	0.12
15	0.25
20	0.20
25	0.20
30	0.15

Table Q3(b) shows ten random numbers:

Table Q3(b): Random numbers

No.	Random number
1	0.8689
2	0.7369
3	0.7235
4	0.2098
5	0.1132
6	0.3762
7	0.9505
8	0.1591
9	0.4832
10	0.4834

(a)   Construct intervals of random numbers.

(2 marks)

(b)   Simulate 10 days demand by using the results in **Q3(a)** and **Table Q3(b)**.

(2 marks)

(c)   Calculate Sunrise Bakery's total profit for 10 days using the results in **Q3(b)**.

(16 marks)

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Q4 (a) After studying a brand-switching problem, an analyst concluded that Brand A loses 20 percent of its customers each period to Brand B and 10 percent to Brand C. Brand B loses 10 percent of its customers each period to Brand A and 30 percent to Brand C. Brand C loses 30 percent to Brand A and 20 percent to Brand B.

Tabulate the matrix of transition probabilities.

(5 marks)

(b) A rural community has two television stations, and each Wednesday night the local viewers watch either the Wednesday Movie or a show called Western Times. **Table Q4** shows the transition matrix which contains the probabilities of a viewer's watching one of the shows in a week, given that he or she watched a particular show the preceding week.

Table Q4: Transition matrix

This week	Next week	
	Wednesday Movie	Western Times
Wednesday Movie	0.75	0.25
Western Times	0.45	0.55

(i) Compute the steady-state probabilities.

(10 marks)

(ii) Assume that the community contains 1,200 television sets.

Compute the number of television sets tuned to each show in the long run.

(4 marks)

(iii) A prospective local sponsor wanted to pay for commercial time on one of the shows.

Determine which show would more likely be selected.

(1 mark)

Q5   A company producing torches is negotiating with a company for the supply of torch bulbs. The bulb company therefore needs to plan its production to meet the needs of the torch company and thus uses that company's quarterly demand over the past three years to forecast future demand. **Table Q5** shows the sales figures of 2021 to 2023.

Table Q5: Quarterly sales figures of 2016-2018 (in thousands)

Year	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2021	349	295	196	389
2022	447	418	324	456
2023	550	528	415	615

Calculate the forecasted demand for four quarters of 2024 through moving average technique using:

(a)   Trend regression line

(10 marks)

(b)   Seasonal variation factors

(10 marks)

-END OF QUESTIONS –

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