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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2012/2013**

COURSE NAME : MANAGEMENT SCIENCE II
COURSE CODE : BPB 20603
PROGRAMME : 2 BPA
EXAMINATION DATE : JUNE 2013
DURATION : 3 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF SIX (6) PAGES

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- Q1** A corporation makes a decision to produce a new line of recreational products resulted in the need to construct either a small plant or a large plant. The best selection of plant size depends on how the marketplace reacts to the new product line. To conduct an analysis, marketing management has decided to view the possible long-run demand as low, medium, or high. **Table Q1** is a payoff table that shows the projected profits in millions of ringgit.

Table Q1: Projected profits

Plant Size	Long-Run Demand		
	Low	Medium	High
Small	150	200	200
Large	50	200	500

- (a) State the decision to be made, and the chance event for this problem. (4 marks)
- (b) Construct an influence diagram. (6 marks)
- (c) Recommend a decision based on the use of optimistic, conservative, and minimax regret approaches. (10 marks)

- Q2 (a)** The purchase patterns for two brands of toothpaste can be expressed as a Markov process with the transition probabilities as shown in **Table Q2 (a)**.

Table Q2 (a): Transition probabilities

From	To	
	Brand C	Brand D
Brand C	0.90	0.10
Brand D	0.05	0.95

Determine the projected market shares for these two brands of toothpaste.

(8 marks)

- (b)** A firm uses two aging categories for its accounts receivable:

- (1) accounts that are classified as 0–30 days old, and
- (2) accounts that are classified as 31–90 days old.

If any portion of an account balance exceeds 90 days, that portion is written off as a bad debt. The firm follows the procedure of aging the total balance in any customer's account according to the oldest unpaid bill. The estimated amount of bad debts will appear as an allowance for doubtful accounts in the year-end financial statements. As the firm continues to operate into the future, it is considered that each week as a trial of a Markov process with a ringgit existing in one of the following states of the system:

- State 1. Paid category
- State 2. Bad debt category
- State 3. 0–30-day category
- State 4. 31–90-day category

Suppose that the following transition matrix is appropriate

$$P = \begin{bmatrix} 1.0 & 0.0 & 0.0 & 0.0 \\ 0.0 & 1.0 & 0.0 & 0.0 \\ 0.5 & 0.0 & 0.25 & 0.25 \\ 0.5 & 0.2 & 0.05 & 0.25 \end{bmatrix}$$

Estimate the amount of bad debts given that the firm has RM4 000 in the 0–30-day category and RM5 000 in the 31–90-day category.

(12 marks)

- Q3 (a)** The owner of a large horse breeding farm is planning to install a complete water system connecting all of the various stables and barns. The location of the facilities and the distances between them is given in **Figure Q3 (a)**.

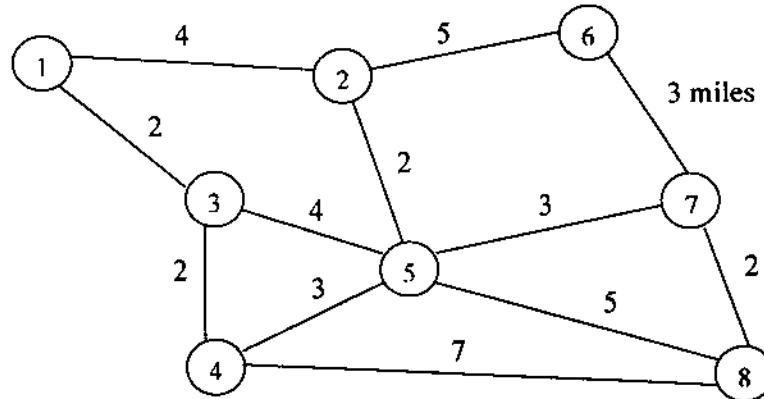


Figure Q3 (a): Location of facilities

Recommend the least expensive way to provide water to each facility. (10 marks)

- (b)** A construction firm would like to determine the least expensive way of connecting houses it is building with cable telephone. It has identified 11 possible routes that could be used to connect the houses. The cost in hundreds of ringgit and the routes are summarized in **Table Q3 (b)**.

Table Q3 (b): Costs (in hundreds of ringgit)

Route	Start Node	End Node	Cost
Route 1	1	2	5
Route 2	1	3	6
Route 3	1	4	6
Route 4	1	5	5
Route 5	2	6	7
Route 6	3	7	5
Route 7	4	7	7
Route 8	5	8	4
Route 9	6	7	1
Route 10	7	9	6
Route 11	8	9	2

Recommend the least expensive way to run cable to the houses. (10 marks)

- Q4 (a) Consider the road network in Figure Q4 (a). The numbers above each arc represent the distance (in kilometer) between the connected nodes.

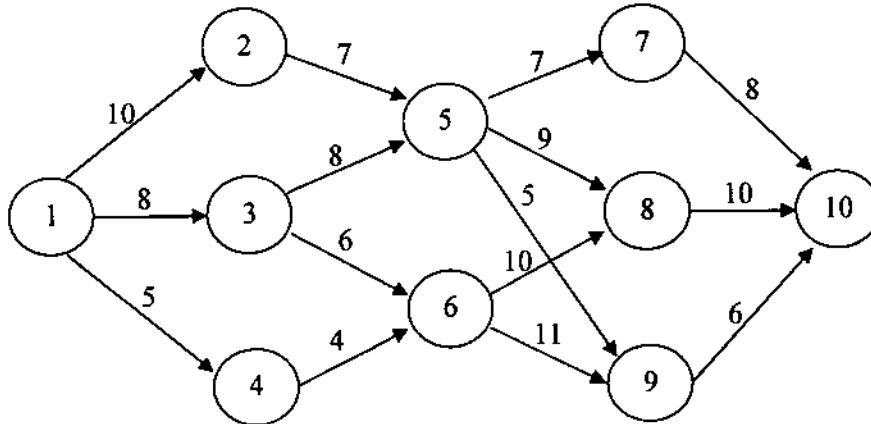


Figure Q4 (a): Road network

Calculate the shortest route from Node 1 to Node 10 by using dynamic programming.

(10 marks)

- (b) A firm just hired eight new employees and would like to determine how to allocate their time to four activities. Table Q4 (b) shows the estimated profit for each activity as a function of the number of new employees allocated to it.

Table Q4 (b): Estimated Profit

Activities	Number of New Employees									
	0	1	2	3	4	5	6	7	8	
1	22	30	37	44	49	54	58	60	61	
2	30	40	48	55	59	62	64	66	67	
3	46	52	56	59	62	65	67	68	69	
4	5	22	36	48	52	55	58	60	61	

Determine the optimal allocation of new employees to the activities by using dynamic programming.

(10 marks)

- Q5** A TV program producer is considering producing a pilot for a comedy series in the hope of selling it to a major television network. The network may decide to reject the series, but it may also decide to purchase the rights to the series for either one or two years. At this point in time, the producer may either produce the pilot and wait for the network's decision or transfer the rights for the pilot and series to a competitor for RM100 000. The producer's decision alternatives and profits (in thousands of ringgits) are shown in **Table Q5**.

Table Q5: Profits

Decision Alternative	State of Nature		
	Reject, s_1	1 Year, s_2	2 Years, s_3
Produce pilot, d_1	-100	50	150
Sell to competitor, d_2	100	100	100

The probabilities for the states of nature are

$$P(s_1) = 0.20, P(s_2) = 0.30, \text{ and } P(s_3) = 0.50.$$

For a consulting fee of RM5 000, an agency will review the plans for the comedy series and indicate the overall chances of a favorable network reaction to the series. Assume that the agency review will result in a favorable (F) or an unfavorable (U) review with the following probabilities:

$$\begin{array}{lll}
 P(F) = 0.69 & P(s_1 | F) = 0.09 & P(s_1 | U) = 0.45 \\
 P(U) = 0.31 & P(s_2 | F) = 0.26 & P(s_2 | U) = 0.39 \\
 & P(s_3 | F) = 0.65 & P(s_3 | U) = 0.16
 \end{array}$$

- (a) Construct a decision tree for this problem. (6 marks)
- (b) Determine the decision if the agency opinion is not used. (2 marks)
- (c) Determine the producer's optimal decision strategy assuming the agency's information is used. (10 marks)
- (d) Identify the expected value of the agency's information. (2 marks)

- END OF QUESTION -