



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023**

COURSE NAME : NETWORK FLOW

COURSE CODE : BWA 31003

PROGRAMME CODE : BWA

EXAMINATION DATE : JULY/ AUGUST 2023

DURATION : 3 HOURS

INSTRUCTION : 1. ANSWER ALL QUESTIONS

2. THIS FINAL EXAMINATION IS CONDUCTED VIA **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 **THREE (3)** PAGES

Q1 An electronic company produces two types of television sets, HD and non-HD. The production of an HD set requires 12 hours of skilled and 120 hours of unskilled labour. The production of a non-HD set requires 7 hours of skilled and 170 hours of unskilled labour. The company has 100 hours of skilled labour and 1,500 hours of unskilled labour normally available per month for the production of television sets. The maximum number of non-HD and HD sets that can be sold each month are 45 and 80, respectively. The profit margin from the sale of an HD set is RM300, whereas it is RM150 for a non-HD set. The company has set the following goals:

1. Avoid the over-utilization of skilled labour since it is hard to obtain in the labour market.
2. Minimize the under-utilization of unskilled labour.
3. Meet the demand as much as possible.
4. Limit over-utilization of unskilled labour to 100 hours.

Formulate the problem as a goal programming model. Do not solve the model.

(10 marks)

Q2 Consider the following pre-emptive goal programming model.

$$\text{Minimize } P_1(d_1^+ + d_2^-) + P_2(d_3^-) + P_3(d_4^- + 2d_5^-)$$

subject to

$$\begin{aligned} 2x_1 + 3x_2 - d_1^+ + d_1^- &= 680 \\ 2x_1 + 3x_2 - d_2^+ + d_2^- &= 600 \\ 250x_1 + 125x_2 - d_3^+ + d_3^- &= 70,000 \\ x_1 - d_4^+ + d_4^- &= 200 \\ x_2 - d_5^+ + d_5^- &= 120 \\ x_1, x_2, d_1^-, d_1^+, d_2^-, d_2^+, d_3^-, d_3^+, d_4^-, d_4^+, d_5^-, d_5^+ &\geq 0 \end{aligned}$$

(a) Use the graphical goal programming procedure to solve the problem.

(15 marks)

(b) If the first and third priority levels are interchanged, what would be the new solution?

(5 marks)

Q3 Hamid is planning to go hiking at Gunung Tahan. He has to choose among several items that he can pack, and how many of each item to take with him. He can carry up to 10kg in his knapsack. He just considers 3 possible items, whose weights and values are summarized in **Table Q3**.

Table Q3

| Item | Weight (kg) | Value |
|--------------------------|-------------|-------|
| 1. Food pack | 3 | 7 |
| 2. Large bottle of water | 4 | 8 |
| 3. Tent | 6 | 11 |

Determine the number of each item to be taken in order to maximize the total value while not exceeding his 10kg carrying capacity?

(15 marks)

- Q4** The ANN Sdn. Bhd. has estimated the next three months of their product demand level as in **Table Q4**. The company would like to determine a minimum cost production schedule. The setup cost for the production is RM10, the unit production cost is RM3, and the inventory carrying cost is RM2 per unit per month. ANN has a maximum production capacity of 5 units a month. At the beginning of June, they have one unit in inventory from the previous month and wants one unit in inventory after August.

Table Q4

| Month | Demand |
|--------|--------|
| June | 4 |
| July | 3 |
| August | 3 |

By using dynamic programming, determine the optimum production schedule.

(15 marks)

- Q5** The cost of delivery of a unit of production (in RM) from the supplier to the consumer is located in the lower right corner of the cell in **Table Q5**.

Table Q5

| Supplier | Consumer | | | Supply |
|----------------|-----------|-----------|-----------|--------|
| | <i>X1</i> | <i>X2</i> | <i>X3</i> | |
| <i>W1</i> | 50 | 30 | 10 | 100 |
| <i>W2</i> | 30 | 20 | 40 | 200 |
| <i>W3</i> | 40 | 10 | 20 | 300 |
| Customer Needs | 150 | 200 | 250 | |

It is necessary to construct a transport plan in which the total cost of delivery will be the lowest. By using the Least Cost Method, find the initial feasible solution. Hence, use an appropriate method to determine the optimal solution.

(20 marks)

TERBUKA

- END OF QUESTIONS -