



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2013/2014**

COURSE NAME : OPERATIONAL RESEARCH  
COURSE CODE : BPC 30803  
PROGRAMME : 3 BPB  
EXAMINATION DATE : DECEMBER 2013/JANUARY 2014  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER **ALL** QUESTIONS

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

- Q1** HyperTV Sdn. Bhd. would like to determine the shortest way of connecting houses it is building with cable TV. It has identified 16 routes that could be used to connect the houses. Table **Q1** shows the television networks at each houses.

**Table Q1** : The television networks at each house

Vertices	Start Node	End Node	Capacity (Meter)
1	1	2	5
2	1	3	9
3	1	4	20
4	1	5	4
5	1	8	14
6	1	9	15
7	2	3	6
8	3	4	15
9	3	5	20
10	4	5	20
11	4	6	7
12	5	7	5
13	5	8	13
14	5	9	6
15	7	8	7
16	8	9	5

- (a) Draw the network diagram for the above problem. (6 marks)
- (b) Calculate the minimum route for cable connection among the houses. (14 marks)

- Q2** Fire department has five squads available to be assigned to five open cases. The chief of detective, wishes to assign the squads so the total time to conclude the cases is minimized. Table **Q2** show the average number of days, based on past performance, for each squad to complete each case. Each squad had a different types of specialists, and whereas one squad may be very effective in certain types of cases.

**Table Q2 :** The average number of days, based on past performance, for each squad to complete each case

Squad	Case				
	A	B	C	D	E
<b>1</b>	14	7	3	7	27
<b>2</b>	20	7	12	6	30
<b>3</b>	10	3	4	5	21
<b>4</b>	8	12	7	12	21
<b>5</b>	13	25	24	26	8

- (a) Propose the suitable case for each squad using the Assignment Method.  
(10 marks)
- (b) Propose the suitable case for each squad using the Assignment Method with the constraint that squad 5 cannot work on case E.  
(10 marks)

**Q3** Baja Sdn. Bhd. has plants in three locations and is currently working on three major location. Requirement for location A, B and C are 150, 70 and 60 tonnes. Plant 1 has a capacity 120 tonnes, plant 2 = 80 tonnes and plant 3 = 80 tonnes. The shipping cost per truck load are as the following, from factory 1 to location A = RM8, B = RM5 and C = RM3. Meanwhile, the cost of transportation from factory 2 to location A = RM15, B = RM2 and C = RM2. Factory 3 to location A = RM3, B = RM7 and C = RM0.

- (a) Construct the table with appropriate costs and requirements. (2 marks)
- (b) (i) Calculate the initial feasible, using the Corner West Method (2 marks)
- (ii) Starting with the initial feasible solution obtained in part **Q3(b)(i)**, solve the transportation problem using Stepping Stone method. (Solve until two iteration) (7 marks)
- (c) (i) Calculate the initial feasible using Vogel Approximation Method (VAM) (2 marks)
- (ii) Starting with the initial feasible solution obtained in part **Q3(c)(i)**, solve the problem using Modified Distribution Method (MODI). (7 marks)

- Q4** The Digit mobile phone company served six areas. The distances in Kilometer (KM) for six areas are given in Table Q4. The Digit needs to determine the most efficient message route that should be established between two areas in the network.

**Table Q4 :** The Digit networks

Arc	Start Node	End Node	Capacity (KM)
1	1	2	700
2	1	3	200
3	2	3	300
4	2	4	200
5	2	6	400
6	3	4	700
7	3	5	600
8	4	5	300
9	4	6	100
10	5	6	500

- (a) Illustrate the network diagram for the above problem. (3 marks)
- (b) Analyse the shortest route using Floyd-Warshall algorithm. (15 marks)
- (c) Determine the shortest route from Node 1 to Node 5 in the network. (2 marks)

- Q5** Syabass Sdn. Bhd. needs to determine a flow plan that will maximize the flow of water to the city. There are 10 pipeline in the network. Table **Q5** shows the network of pipelines with weighted for each city.

**Table Q5** : Network of pipeline with weighted for each city

Vertices	Start Node	End Node	Capacity (hundreds of gallons)	Reverse Capacity (hundreds of gallons)
1	1	2	8	0
2	1	3	14	0
3	1	5	4	0
4	2	1	0	8
5	2	3	5	10
6	2	4	7	6
7	2	5	6	0
8	3	1	0	14
9	3	2	10	5
10	3	4	9	7
11	3	5	10	0
12	4	2	6	7
13	4	3	7	9
14	4	5	5	0
15	5	1	0	4
16	5	2	0	6
17	5	3	0	10
18	5	4	0	5

- (a) Illustrate the network diagram for the problem above. (3 marks)
- (b) Propose to Syabass Sdn Bhd, the maximum water that can flow through the network. (17 marks)

**-END OF QUESTION-**