

**CONFIDENTIAL**



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2016/2017**

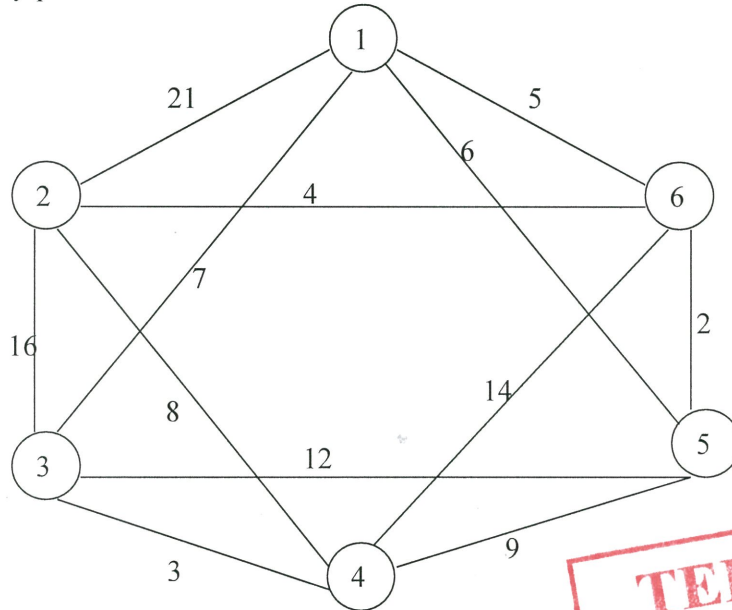


COURSE NAME : OPERATIONAL RESEARCH  
COURSE CODE : BPC 30803  
PROGRAMME CODE : BPB  
EXAMINATION DATE : DECEMBER 2016 / JANUARY 2017  
DURATION : 3 HOURS  
INSTRUCTION : ANSWERS **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

**CONFIDENTIAL**

**Q1** A telephone line network must be installed under the roads to establish telephone communication among all the stations as shown in **Figure Q1**. Since the installation is expensive, line will be installed under just enough roads to provide some connection between every pair of station.

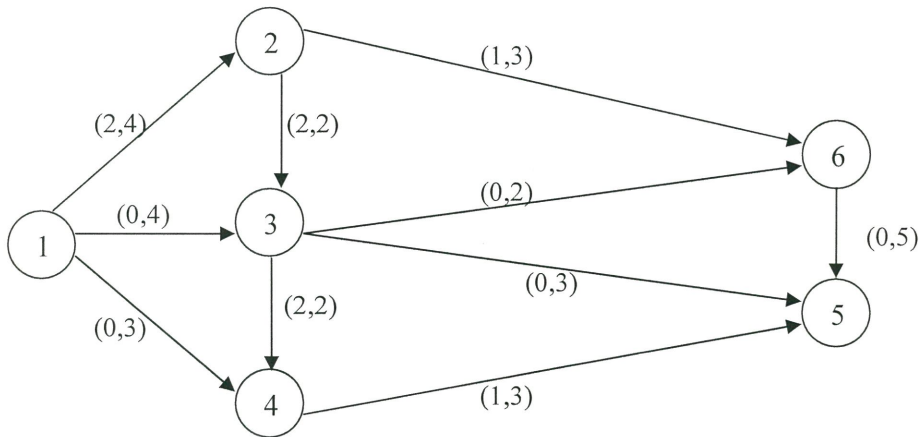


**Figure Q1**



- (i) Analyze how the network will be designed to minimize the total cost. (18 marks)
- (ii) Determine the total cost. (2 marks)

**Q2** The Water Company wants to determine a flow plan that will maximize the flow of water to the city. **Figure Q2** shows the network of pipeline with weighted for each arcs.



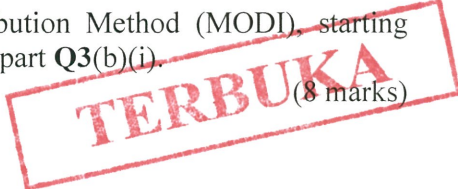
**Figure Q2**

Propose to the company, the maximum water that can flow through the network.

(20 marks)

**Q3** Baja Sdn Bhd has plants in three locations and is currently working on three major locations. Requirement for location A, B and C are 150, 70 and 60 tons. Plant 1 has a capacity 120 tons, plant 2 = 80 tons and plant 3 = 80 tons. 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. (4 marks)
- (b) (i) Calculate the initial feasible solution using Vogel Approximation Method (VAM). (8 marks)
- (ii) Solve the problem using Modified Distribution Method (MODI), starting with the initial feasible solution obtained in part Q3(b)(i). (8 marks)



**Q4** Five lorries will be used to ship goods from one to other factories (labeled 1, 2, 3, 4, 5). Any lorry can be used for making any one of these five trips. However because of differences in lorry, the total cost of transportation for different lorry-factory varies considerably as shown by the following Table Q4.

**Table Q4**

	Factory 1	Factory 2	Factory 3	Factory 4	Factory 5
Lorry 1	14	7	3	7	27
Lorry 2	20	7	12	6	30
Lorry 3	10	3	4	5	21
Lorry 4	8	12	7	12	21
Lorry 5	13	25	24	26	8

Determine the minimum total cost assignment for all five shipments.

(20 marks)

- Q5** The mobile phone company services at six areas. The distances (KM) among six areas are given in **Table Q5**. The company needs to determine the most efficient message route that should be established between each two areas in the network.

**Table Q5**

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

**TERBUKA**

- (a) Analyse the shortest route using Floyd-Warshall algorithm. (18 marks)
- (b) Identify the shortest route from Node 1 to Node 5 in the network. (2 marks)

**-END OF QUESTIONS -**