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**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2017/2018**

COURSE NAME : OPERATIONAL RESEARCH  
COURSE CODE : BPC 30803  
PROGRAMME CODE : BPB  
EXAMINATION DATE : DECEMBER 2017 / JANUARY 2018  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER ALL QUESTIONS

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

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- Q1** (a) The hospital administrator must appoint head nurses to four newly established departments. The four departments are Urology, Cardiology, Orthopaedics and Obstetrics. Four staff will be assigned to the department, with each staff interviewed and rating based on scale of 4 (excellent), 3 (very good), 2 (average), 1 (fair) and 0 (poor). The evaluation for each staff is shown in **Table Q1**.

Propose which nurse should be assigned to which department.

**Table Q1 : Nurse rating**

Nurse	Department			
	Urology	Cardiology	Orthopedics	Obstetrics
A	2.8	2.2	3.3	3.0
B	3.2	3.0	3.6	3.6
C	3.3	3.2	3.5	3.5
D	3.2	2.8	3.5	1.8

(12 marks)

- (b) Propose which nurse should be assigned to which department, with the constraint that the nurse will not be appointed if the evaluation rating is below  $\sqrt{}$ (fair).

2 (13 marks)

- Q2** The MRTT specializes in coal handling. MRTT has train in three locations (1,2 and 3) and is currently working on another four locations (A, B, C and D). Requirement for existing locations 1, 2 and 3 are 35, 60 and 25 tons respectively. Location A has a capacity 30 tons, location B = 45 tons, locations C = 25 tons and location D = 20 tons. The distance per location as the following, from 1 to location A = 50 km, B = 30 km, C = 60 km and D = 70 km. Meanwhile, distance from 2 to location A = 20 km, B = 80 km, C = 10 km and D = 90. Location 3 to location A = 100 km, B = 40 km, C = 80 km and D = 30 km.

- (a) Construct the table with appropriate costs and requirements.

(4 marks)

- (b) (i) Calculate the initial feasible solution, using the <sup>Northwest</sup> Corner ~~West~~ Method.

(6 marks)

- (ii) Solve the transportation problem using Modified Distribution Method (MODI), starting with the initial feasible solution obtained in part **Q2(b)(i)**

(15 marks)

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**Q3** There are 12 possible paths from JB to BP. Each path can be considered a branch in the shortest-path problem. The distances (KM) among 5 areas are given in **Figure Q3**.

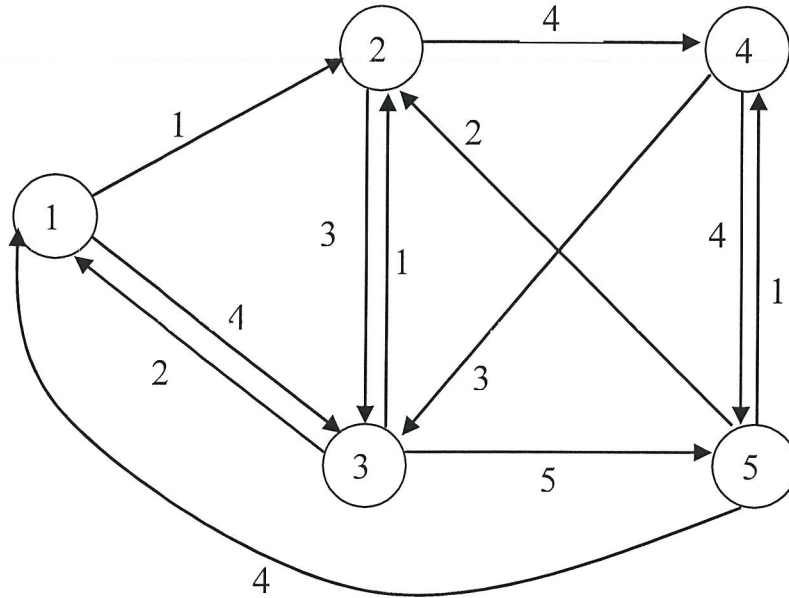


Figure Q3 : JB to BP networks

- (a) Analyse the shortest route using Floyd-Warshall algorithm. (21 marks)
- (b) Determine the shortest distance and shortest path from Node 1 to Node 5 using result in Q3(a). (4 marks)

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**Q4** SAJJ wants to determine a flow plan that will maximize the flow of water to the city. There are 10 pipelines in the network. **Table Q4** shown the network of pipelines with weighted for each city.

**Table Q4 : Network of pipeline with weighted for each city**

Arc	Start Node	End Node	Capacity	Reverse Capacity
1	1	2	200	400
2	1	3	0	400
3	1	4	0	300
4	2	3	200	200
5	3	4	200	200
6	2	6	100	300
7	3	6	0	200
8	3	5	0	300
9	4	5	100	300
10	6	5	0	500

- (a) Illustrate the network diagram. (4 marks)
  
- (b) Recommend maximum water that can flow through the network. (21 marks)

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- END OF QUESTIONS -