



**UNIVERSITI TUN HUSSEIN ONN  
MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2011/2012**

COURSE NAME : OPERATIONAL RESEARCH  
COURSE CODE : BPC 3083/ BPC 30803  
PROGRAMME : 2 BPB/ 3 BPB  
EXAMINATION DATE : JANUARY 2012  
DURATION : 3 HOURS  
INSTRUCTION : ANSWER ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF 7 PAGES

- Q1 (a) Max profit =  $\$4X_1 + \$1X_2$   
 Subject to :
- $$3X_1 + X_2 = 3$$
- $$4X_1 + 3X_2 \geq 6$$
- $$X_1 + 2X_2 \leq 3$$
- $$X_1, X_2 \geq 0$$

Solve the problem using the Simplex Method.

(11 marks)

- (b) Max profit =  $\$8,500X_1 + \$6,000X_2$   
 Subject to :
- $$X_1 + X_2 \leq 10$$
- $$1,000X_1 + 700X_2 \leq 7200$$
- $$X_1, X_2 \geq 0$$

$X_1 = 2.3, X_2 = 9 \frac{1}{3}$  and profit = RM61,667.

Solve the problem using Branch and Bound Method starting with variable  $X_2$  using graph in Appendix I.

(9 marks)

- Q2 T-Shirt Sdn Bhd has five tailors and currently distributed school uniform to four shops. Requirement for shop S1, S2, S3 and S4 are 60, 60, 20 and 10 carton respectively. Tailor A has a capacity of 10 carton, tailor B has 20 carton, tailor C has 30 carton, tailor D has 40 carton and tailor E has 50 carton. The shipping cost per lorry load are provided in the Table Q2.

**Table Q2 : The shipping cost**

Tailor	Shop			
	S1	S2	S3	S4
A	RM10	RM20	RM5	RM7
B	RM13	RM9	RM12	RM8
C	RM4	RM15	RM7	RM9
D	RM14	RM7	RM1	RM0
E	RM3	RM12	RM5	RM19

- (a) Calculate the initial feasible solution using ;
- (i) The Corner West Method. (3 marks)
  - (ii) Vogel's Approximation Method (9 marks)
- (b) Compute the best initial solution from Q2(a) using Modified Distribution Method (MODI) for 1<sup>st</sup> iteration only. (8 marks)

- Q3 (a) Figure Q3(a) shows a problem of assigning four operators to four machines. Operator 1 cannot be assigned to machine 3 and operator 2 cannot be assigned to machine 4.

Solve the problem using Hungarian method.

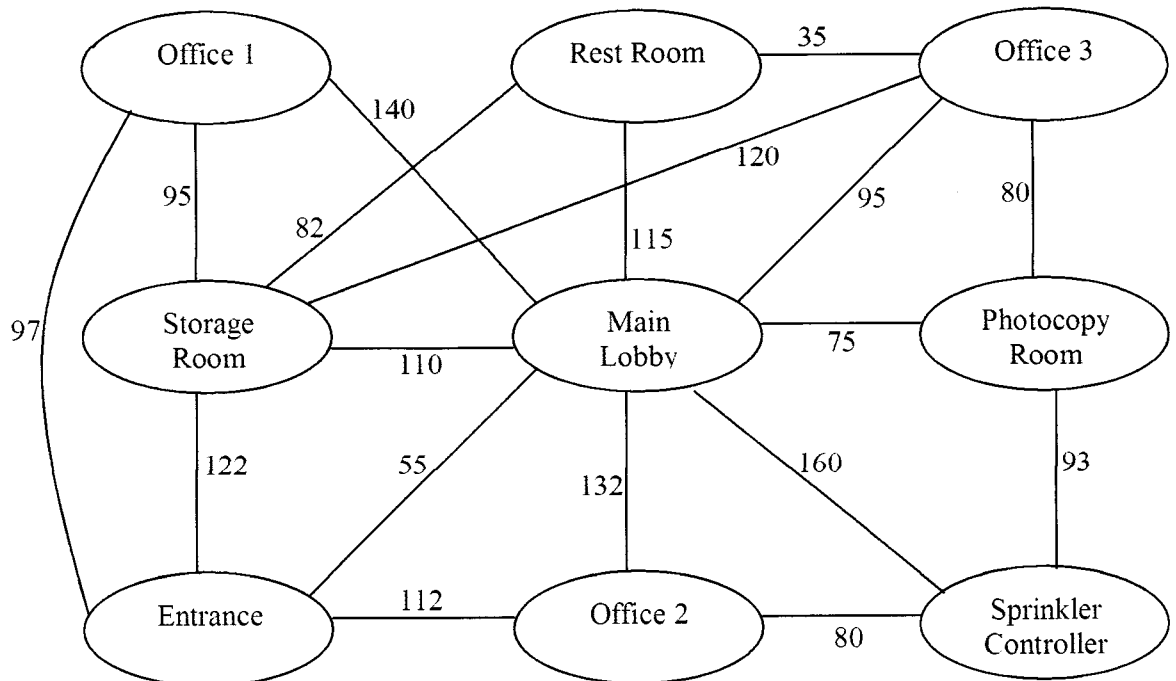
**Table Q3(a) : Cost operator per machine**

Operator	Machine			
	1	2	3	4
1	RM15	RM15	-	RM6
2	RM21	RM12	RM6	RM9
3	RM27	RM9	RM15	-
4	RM21	RM6	RM18	RM21

(10 marks)

- (b) A recent tragic fire has prompted the City Council to draft a new ordinance requiring all buildings to have fully operational sprinkler systems installed by the end of the year. The AB Building is affected by this ordinance. The feasible connections between these eight sprinkler heads and the controller with distance shown in feet are depicted in the figure Q3(b).

Recommend the design of sprinkler system that will minimize the total amount pressure throughout the system.

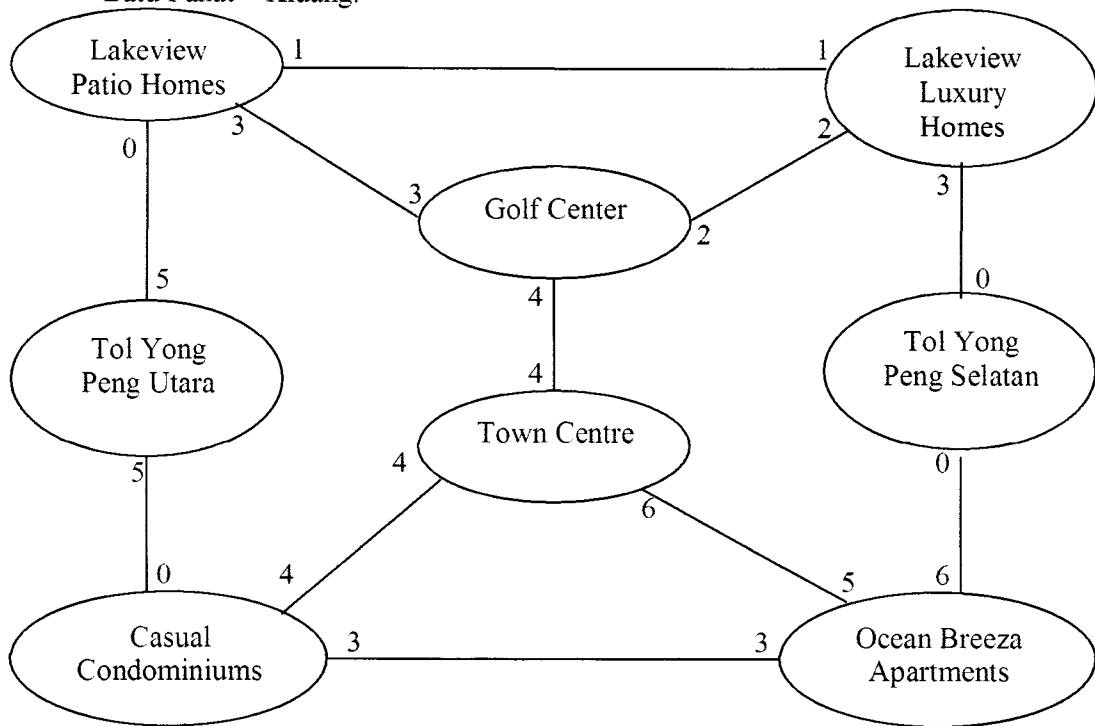


**Figure Q3(b) : AB building Sprinkler Location**

(10 marks)

**Q4** Pura Kencana Ria is the latest planned community project to be proposed for Batu Pahat. The community will have two exits onto Yong Peng Selatan's Tol and will consists of 11 small roads. The traffic capacities of each road (in term of hundreds of vehicles per hour) are provided in figure Q4.

Calculate the maximum hourly flow of vehicles that can travel from the north exit of Yong Peng Selatan's Tol through Pura Kencana Ria to the south exit of Jalan Batu Pahat – Kluang.

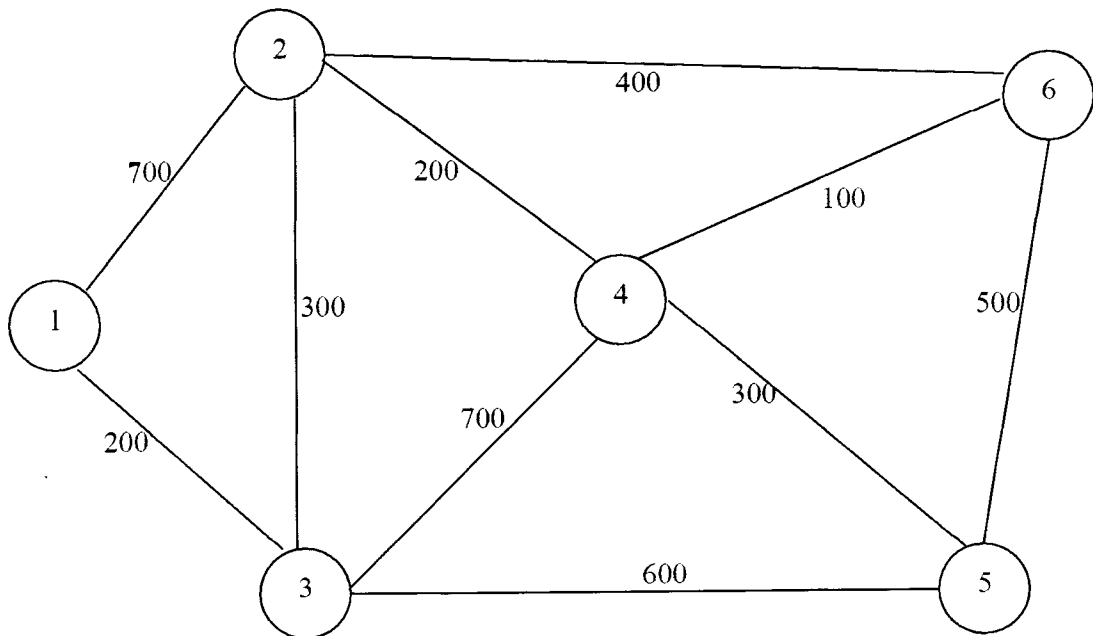


**Figure Q4 : Pura Kencana Ria Road System**

(20 marks)

Q5 The DIJI mobile phone company services six geographical areas. The satellite distance (in miles) among the six areas are given in figure Q5.

Analyze most efficient message routes that should be established between each two areas in the network.



**Figure Q5 : DIJI's satellite services**

(20 marks)

**END OF QUESTION PAPER**

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