UNIVERSITI SAINS MALAYSIA

First Semester Examination
Academic Session 2004/2005

October 2004

CCS501 - Neural Networks and Genetic Algorithms

Duration : 2 hours

INSTRUCTION TO CANDIDATE:

- Please ensure that this examination paper contains **THREE** questions in **FOUR** printed pages before you start the examination.
- Answer **ALL** questions.
- You can choose to answer either in Bahasa Malaysia or English.

ENGLISH VERSION OF THE QUESTION PAPER

1. The Taj Lobster Company owns ten lobster restaurants in Penang, which is supplied daily from a depot. The depot has five lorries, which does the delivery every morning. Every restaurant will fax in their requirement the previous night. Each lorry can carry a maximum of 100 cubic meters of supplies. The manager has to plan the deliveries such that a minimum number of lorries are used.

   Following is a sample requirement of the ten restaurants:

Restaurant	1	2	3	4	5	6	7	8	9	10
Requirement (m^3)	25	54	30	45	30	60	40	55	50	30

   (a) If you are going to solve this problem using genetic algorithm, provide a suitable representation and justify your choice against other possibilities.

   (20/100)

   (b) Provide a suitable fitness function, which will allow you to measure the fitness of a solution for this problem.

   (20/100)

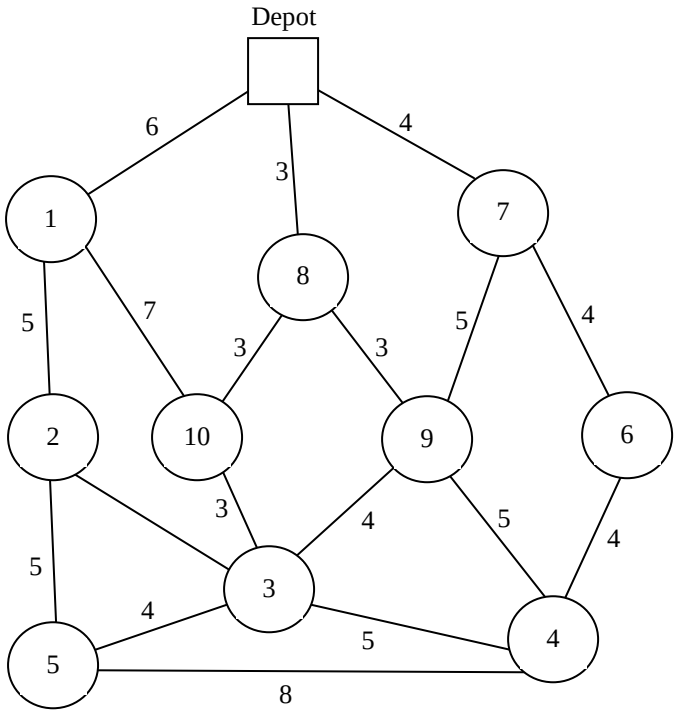
   (c) Assuming you are only using two point crossover (and no mutation), the population size is 4, tournament selection is used for parent selection, and the offspring completely replace the old generation. The first generation is generated randomly. Show the first and second generation. Indicate how each individual in the second generation is generated.

   (40/100)

   (d) What is the purpose of mutation in genetic algorithm and how will the absence of mutation affect the search process in genetic algorithm?

   (20/100)

2. The Taj Lobster Company has a new chief executive officer (CEO). He decides that the company will minimize the total distance traveled by the lorries instead of minimizing the number of lorries used. Following is the map showing the depot and the ten restaurants including the distance between them. (Other requirements remain as in question (1)).



(a) If you are going to solve this problem using ant system, describe how you would model the problem and justify your choice against other possibilities.

(40/100)

(b) Indicate how will the $\Delta\tau_{ij}$ **(t, t+n)** be measured. This is the amount of pheromone deposited between **i** and **j** by an ant.

(20/100)

(c) Specify how you will calculate the probability of choosing the next point to visit in this problem.

(20/100)

(d) Discuss the suitability of ant system to solve this problem.

(20/100)

3. (a) If you are required to solve the problem in Question 1 using tabu search:

(i) Indicate the content of the tabu list and explain your choice.

(ii) Indicate a suitable size for the tabu list with justification.

(iii) Specify the move.

(40/100)

(b) Discuss the suitability of using constraint satisfaction in solving the problem in Question 1.

(20/100)

(c) Is neural networks suitable for solving the problem in Question 1? Explain your answer.

(20/100)

(d) Explain the success of evolutionary algorithms in solving optimization problems.

(20/100)

- oooOooo -