

## Problem 1

### 1a (weight 10%)

Are long runs beneficial in genetic algorithm? Is it helpful to apply extra efforts on smart initialisation of population in genetic algorithm?

### 1b (weight 10%)

Given the following two chromosomes. Show and explain how these can be combined into two new individuals by  $n$ -point crossover (mention the value of your chosen  $n$ ) and uniform crossover?

1	0	0	1	0	1	1	1	0	1
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1	1	0	1	1	0	1	0	0	0
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For the following chromosome used for permutation representation, show and explain the effect of insert mutation and swap mutation. You can make any necessary assumption, however you should mention it.

1	5	9	6	2	3	10	7	8	4
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### 1c (weight 5%)

What do you mean by linear scaling of fitness values and why is it useful?

### 1d (weight 5%)

Describe “bloat” phenomenon in genetic programming. How it can be handled?

### 1e (weight 5%)

What is pareto-front? Explain with any real-world example.

### 1f (weight 10%)

With the help of a flowchart, describe the basic idea behind ant colony optimization.

### 1g (weight 5%)

Discuss the design issues for memetic algorithm.

## Problem 2

**2a (weight 10%)**

Discuss different important parts of learning. Do you think multi-layer perceptron network is better than simple perceptron network? Give example in favor of your answer.

**2b (weight 5%)**

What is meant by overfitting? Why and when it occurs?

**2c (weight 10%)**

List and discuss any three techniques used for cross validation.

**2d (weight 5%)**

What are support vectors? Mention various issues involved in the implementation of support vector machines.

**2e (weight 5%)**

What is the motivation behind principle component analysis?

**2f (weight 10%)**

What is the main criticism on multi-layer perceptron network? What is the main assumption on naïve bayes classifier? Why is it important?

**2g (weight 5%)**

List the problems that typically arise in  $k$ -means algorithm. Mention solutions to these problems.