Evolutionary Computing

Midterm Exam

1. *(15 points)* Define the following terms: infeasible solution, local optimum, basin of attraction, constraint, fitness function.

2. *(15 points)* Answer the following questions briefly for a multi-dimensional knaspsack problem (MKP) with 1200 items and 50 knapsacks.

   (a) If we are using a binary encoded evolutionary algorithm to solve the above MKP, what is the size of the search space?

   (b) Why do we need heuristic search techniques to solve it?

3. *(25 points)* Consider the strings and schemata of length 11.

   (a) Calculate the probability of an 11 bit string being changed through mutation.

   (b) For the following schemata, calculate:
   1**0*   1*********0   *1000010*11

      i. the probability of surviving mutation if the probability of mutation is 0.01 at a single bit position.
      ii. the probability of surviving one-point cross-over if the probability of cross-over is 0.8.

4. *(15 points)* Explain why we need to use statistical tests to compare the performance of evolutionary algorithms?

5. *(15 points)* What are the basic motivations behind using parameter control techniques as opposed to parameter tuning?

6. *(15 points)* What are the basic motivations behind using fitness approximation?