CSCI/ENGR 8940 Computational Intelligence

Assignment Number 4: Due Monday 4/28/2003 **(in class)**

1. [**30 points**] The $subset_{21}$ problem is stated as follows. Given a set of n positive integers $X = x_1, x_2, \ldots, x_n$. Find a **three** element subset $P = p_1, p_2, p_3$ of the set X such that $p_1 + p_2 + p_3 = 21$.

   (a) Formulate the $subset_{21}$ problem as a GA optimization problem:you should include an informal description of the following:

   - The set of variables (genes).
   - The domain of values for each variable.
   - The fitness function.
   - A set of mutation and/or crossover and/or repair operators. Intelligent operators that are suitable for the problem will earn more credit.
   - A termination condition for the GA that ensures a solution to the $subset_{21}$ problem is found (if the given set allows it).

   (b) How would your formulation change if instead of looking for a subset of three elements we look for any subset (of any size) with sum equal to 21?

2. [**30 points**]

   Consider a genetic algorithm for a two-objective optimization problem. Assume that the final population fitness values were as follows (all points were feasible):

Individual	F1	F2
1	4	13
2	1	3
3	8	7
4	5	12
5	6	2

   (a) If our goal is to **maximize** both objectives F1 and F2, what would be the Pareto front?

   (b) If our goal is to **minimize** objective F1 and **maximize** objective F2, what would be the Pareto front?

   (c) If our goal is to **maximize** objective F1 and **minimize** objective F2, what would be the Pareto front?