CSI 5165 Combinatorial Algorithms
Computer Science

Fall 2003
University of Ottawa

Homework Assignment #3 (100 points, weight 15%)
Due: Tuesday, November 25, at 9:00 a.m. (in lecture)

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1. (60 points) **Knapsack: hill-climbing and genetic algorithm**
   Develop a hill-climbing algorithm and a genetic algorithm for the knapsack (optimization) problem.

   For each algorithm, do the following:

   A. Describe the main features of your design. For hillclimbing describe the neighbourhood function and neighbourhood search algorithm. For genetic algorithm, describe recombination, selection of mating pairs and mutation algorithm.

   B. Describe your heuristic search algorithm.

   C. Implement your algorithm (to be included in an appendix).

   D. Test your algorithms with the instances given in Table 5.2 and 5.5 of the textbook. Display your results in tables, testing various values for each parameter in your algorithm and keeping similar statistics as the ones in tables 5.3, 5.4 and 5.6. How do your algorithms compare with results of Algorithms 5.20 and 5.21 given in the tables mentioned above?

2. (10 points) **Certificate for trees**
   Do exercise 7.2 of the texbook (simulate the algorithm by hand computation).

3. (30 points) **Certificate for graphs**
   Apply Algorithm 7.10 in order to compute a certificate for the following graph: