Problem Set No. 3
BMI 226 / CS 426 / EE 392K
Spring 2003

NAME_____

RUNNING THE GENETIC ALGORITHM USING THE "GENESIS" PROGRAM IN C
The "GENESIS" program for the genetic algorithm (GA) operating on fixed-length character strings can be found in several places.

You can also extract the GENESIS code from the GA ARCHIVE:
http://www.aic.nrl.navy.mil/galist/
Take a moment to look over the many items on the home page of the GA archive. Then, click on the link labeled "GA source code" This problem uses the "GENESIS" code in C; however, notice that GA code is also available in C++, Fortran, Jave, LISP, Eiffel.

Also:
• Please hand in a print-out of the functions that you write,
and the reports produced (in rep.xxx).
• Use the following five options (a, c, e, f, g) in GENESIS
• You may include other options as long as they don't affect the results (look in the manual for details)
• Use a random seed of 1234567 (NOT: 123456789).
• Leave the "scaling window", "generation gap", "dump" parameters, and "consecutive generations" at their default values.
• To get a report at every generation, set "num trials" between data collection = population size

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(1) <u>To get acquainted with the program</u>: use it to make the run illustrated in figure 3.15 on page 72 of GASOML. This run uses a population size, *M*, of 30, a chromosome length, *L*, of 30, a maximum number of generations to be run, *G*, of l0 , a crossover probability p_{cross} of 60%, and a mutation probability $p_{mutation}$ of 0.033. The problem involves optimizing the function X^{10}. You should get output something like that shown in figures 3.16, 3.17, and 3.18 on pages 73-75 of GASOML. For this problem and all other problems herein, please use a random seed of 1234567 on one run and a 7- to 8-digit random seed of your own choosing for a second run.

(a) What is the average fitness of a randomly generated individual in the initial population at generation 0 (i.e. the baseline fitness) for the run with the random seed of 1234567?

(b) What is the fitness of the best-of-generation individual of generation 0 for the run with the random seed of 1234567?

(c) What is the fitness of the best-of-generation individual of generation 1 for the run with the random seed of 1234567?

(d) How does the best-of-generation individual of generation 1 compare to the best-of-generation individual of generation 0 (i.e., as a ratio) for the run with the random seed of 1234567?

(e) Describe what happens to the best-of-generation individual between generation 0 and the last generation for the run with the random seed of 1234567:

(f) Describe what happens to the best-of-generation individual between generation 0 and the last generation for the run with the second random seed:

(2) <u>Runs with different control parameters:</u> Using the same values of M, L, and G compare what happened above with what happens when you run the program with:

(a) Values of p_{cross}=0.0 and $p_{mutation}$=0.0 (i.e., no crossover or mutation)?

(b) Values of p_{cross}=0.0 and $p_{mutation}$=0.2 (i.e., relatively high mutation, but no crossover)?

(c) Values of p_{cross}=0.6 and $p_{mutation}$=0.0 (i.e., crossover, but no mutation)?

(3) <u>Test Function F1:</u> Chapter 3 - Problem C on page 88 of Goldberg GASOML. It refers to the "DeJong test function F1" described in GASOML.