Multiple Choice Questions - Circle the letter indicating your choice

1. In an arbitrary unimodal problem: [1]
   (a) all points have exactly one fitter neighbor
   (b) there is only one point which is fitter than all of its neighbors
   (c) there is a unique global optimum but possibly multiple local optima
   (d) none of the above

2. Recombination has the potential to produce an offspring which is different than its parents in its: [1]
   (a) genotype
   (b) number of chromosomes
   (c) alleles
   (d) all of the above

3. Polygeny is defined as: [1]
   (a) one gene affects a single phenotypic trait
   (b) one gene affects multiple phenotypic traits
   (c) multiple genes affect a single phenotypic trait
   (d) multiple genes affect multiple phenotypic traits

4. For traditional Evolutionary Programming which of the following operator sets is correct: [1]
   (a) real-valued vectors, deterministic parent selection, arithmetic crossover, Gaussian mutation, and probabilistic survivor selection
   (b) finite state machines, deterministic parent selection, uniform crossover, Gaussian mutation, and probabilistic survivor selection
   (c) real-valued vectors, deterministic parent selection, no crossover, Gaussian mutation, and probabilistic survivor selection
   (d) none of the above

5. Countermeasures to Bloat in Genetic Programming include: [1]
   (a) reducing the number of alleles to prevent disproportional tree growth
   (b) reducing parsimony pressure to penalize the fitness of large chromosomes
   (c) increasing mutation rate to maintain genetic diversity
   (d) none of the above

6. Learning Classifier Systems are technically speaking: [1]
   (a) a type of Evolutionary Algorithm
   (b) a type of Reinforcement Learning System
   (c) a type of Condition-Action Rule-Based System
   (d) both of the last two types
Regular Questions

7. (a) What is the gray code for the binary number 01011110? [2]

(b) What is the binary number encoded by the gray code 011011001? [2]

8. Given the following two parents with permutation representation:
   \[ p_1 = (918273645) \]
   \[ p_2 = (246813579) \]

   (a) Compute the Edge Crossover as specified in your textbook, except that for each random choice
   you instead select the lowest element. [6]

   (b) Compute the Cycle Crossover as specified in your textbook. [4]

9. Explain briefly the difference between “parameter tuning” and “parameter control”. [4]

10. Explain concisely Rechenberg’s 1/5 success rule. [4]

11. Given the parents (2.4, 1.7, 3.5, 4.2) and (1.4, 0.3, 1.1, 2.6), what single offspring would be created by
    intermediary recombination? [2]

12. Describe briefly the characteristics of Genetic Programming which set it apart from other types of
    Evolutionary Algorithms. [5]

13. What is the closure property in Genetic Programming? [2]


15. Describe concisely the difference between the Pitt approach and the Michigan approach in Learning
    Classifier Systems. [2]