COMP 5660/6660 Fall 2022 Exam 2

This is a closed-book, closed-notes exam. The sum of the max points for all the questions is 76, but note that the max exam score will be capped at 72 (i.e., there are 4 bonus points, but you can't score more than 100%). You have exactly 50 minutes to complete this exam. Keep your answers clear and concise while complete. Good luck!

1. Which of the following EA constraint satisfaction methods inherently reduce the effective search space: [4 pts]

   (a) Penalty Function
   (b) Repair Function
   (c) Closed Feasible Solution Space
   (d) Feasible Decoder

   Select one of:

   - a
   - b
   - c
   - d
   - a and b
   - a and c
   - a and d
   - b and c
   - b and d
   - c and d
   - a, b, and c
   - a, b, and d
   - a, c, and d
   - b, c, and d
   - a, b, c, and d
   - none of a, b, c, nor d

2. There is no recombination in "standard" Evolutionary Programming (EP) because: [4 pts]

   (a) extensive research has shown that the use of recombination is counterproductive in EP
   (b) EP was conceived before the invention of recombination
   (c) each individual in "standard" EP is viewed as the abstraction of a species

   Select one of:

   - a
   - b
   - c
   - none of a, b, nor c

3. In Multi-Objective EAs employing levels of non-domination, a decrease in the number of levels, generally will: [4 pts]

   (a) not impact the amount of selective pressure

   (b) increase the amount of selective pressure

   (c) decrease the amount of selective pressure

   (d) either increase or decrease the amount of selective pressure, depending on the number of conflicting objectives

   Select one of:

   - a
   - b
   - c
   - d
   - none of a, b, c, nor d

4. "Blind Parameter Control" is a better name for the class of parameter control mechanisms named "Deterministic Parameter Control" in the textbook because that class: [4 pts]

   (a) includes stochastic mechanisms

   (b) does not use any feedback from the evolutionary process

   (c) avoids biasing against dissimilar individuals in the population

   Select one of:

   - a
   - b
   - c
   - a and b
   - a and c
   - b and c
   - a, b, and c
   - none of a, b, nor c

5. The Baldwin Effect is: [4 pts]

   (a) improved EA performance obtained by applying local search prior to fitness calculation

   (b) improved EA performance obtained by applying local search after fitness calculation

   (c) improved EA performance obtained by combining local search with Lamarckian evolution

   Select one of:

   - a
   - b
   - c
   - none of a, b, nor c

6. Parameter Control is important in EAs because: [4 pts]

   (a) it somewhat relieves users from parameter tuning as parameter control tends to make EAs less sensitive to its initial parameter values

   (b) left uncontrolled, parameters may experience drift

   (c) optimal EA strategy parameter values may change during evolution

   (d) it significantly reduces the EA parameter space

   Select one of:

   - a
   - b
   - c
   - d
   - a and b
   - a and c
   - a and d
   - b and c
   - b and d
   - c and d
   - a, b, and c
   - a, b, and d
   - a, c, and d
   - b, c, and d
   - a, b, c, and d
   - none of a, b, c, nor d

7. In Diffusion Model EAs: [4 pts]

   (a) individuals are modeled by diffusion equations and only panmictic mating is permitted

   (b) individuals are modeled by diffusion equations and mating is restricted to demes

   (c) the population is conceptually distributed on a grid and only panmictic mating is permitted

   (d) the population is conceptually distributed on a grid and mating is restricted to demes

   Select one of:

   - a
   - b
   - c
   - d
   - a and c
   - b and d
   - none of a, b, c, nor d

8. Genetic drift is caused by: [4 pts]

   (a) finite population size
   (b) uncorrelated self-adaptive mutation
   (c) panmictic mixing
   (d) stochastic survival selection

   Select one of:

   - a
   - b
   - c
   - d
   - a and b
   - a and c
   - a and d
   - b and c
   - b and d
   - c and d
   - a, b, and c
   - a, c, and d
   - b, c, and d
   - a, b, c, and d
   - none of a, b, c, nor d

9. In Fitness Sharing: [4 pts]

   (a) new individuals replace similar population members, resulting in the population sharing the niches equally
   (b) the fitness of individuals immediately prior to selection is adjusted according to the number of individuals falling within some prespecified distance of each other
   (c) individuals share the fitness of similar population members immediately prior to selection, resulting in the number of individuals per niche being dependent on the niche fitness

   Select one of:

   - a
   - b
   - c
   - a and b
   - a and c
   - b and c
   - a, b, and c
   - none of a, b, nor c

10. Modern Evolutionary Programming (EP) is practically merging with modern Evolution Strategies (ES) in the aspects of: [4 pts]

    (a) parent selection
    (b) self-adaptation of mutation step sizes
    (c) the order in which mutation variables and strategy parameters are updated

    Select one of:

    - a
    - b
    - c
    - a and b
    - a and c
    - b and c
    - a, b, and c
    - none of a, b, nor c

11. "Intelligent" initialization in a memetic algorithm can be performed by: [4 pts]

    (a) Seeding
    (b) Selective Initialization
    (c) Locally Optimized Random Initialization
    (d) Mass Mutation

    Select one of:

    - a
    - b
    - c
    - d
    - a and b
    - a and c
    - a and d
    - b and c
    - b and d
    - c and d
    - a, b, and c
    - a, b, and d
    - a, c, and d
    - b, c, and d
    - a, b, c, and d
    - none of a, b, c, nor d

12. The Pitt and Michigan approaches in Learning Classifier Systems differ in that: [4 pts]

    (a) in the Pitt approach each individual has the option of either representing a single rule or a rule set, while in the Michigan approach each individual represents a single rule and the entire population represents the complete rule set

    (b) in the Pitt approach each individual represents a single rule and the entire population represents the complete rule set, while in the Michigan approach each individual has the option of either representing a single rule or a rule set

    (c) in the Pitt approach each individual represents a complete rule set, while in the Michigan approach each individual represents a single rule and the entire population represents the complete rule set

    (d) in the Pitt approach each individual represents a single rule and the entire population represents the complete rule set, while in the Michigan approach each individual represents a complete rule set

    (e) in the Pitt approach each individual represents a complete rule set, while in the Michigan approach each individual has the option of either representing a single rule or a rule set

    Select one of:

    - a
    - b
    - c
    - d
    - e
    - none of a, b, c, d, nor e

13. While in a standard EA an offspring is generated by recombination followed by mutation, in GP one usually generates an offspring either by recombination or by mutating a clone of a parent, not both. This is because: [4 pts]

    (a) the combination of recombination and mutation frequently creates too much stochastic noise, effectively resulting in random search; GP is a relatively new type of EA which allowed its creators to correct this problem by designing it from the start to do either recombination or mutation, but not both at the same time

    (b) recombination and mutation are often quite destructive in GP and doing both would effectively result in random search

    (c) performing both recombination and mutation would violate the closure property of GP

    Select one of:

    - a
    - b
    - c
    - a and b
    - a and c
    - b and c
    - a, b, and c
    - none of a, b, nor c

14. The exacerbation of premature convergence in memetic algorithms is due to: [4 pts]

    (a) limited seeding
    (b) diversity preserving recombination operators
    (c) non-duplicating selection operators
    (d) Boltzmann selection

    Select one of:

    - a
    - b
    - c
    - d
    - a and b
    - a and c
    - a and d
    - b and c
    - b and d
    - c and d
    - a, b, and c
    - a, b, and d
    - a, c, and d
    - b, c, and d
    - a, b, c, and d
    - none of a, b, c, nor d

15. Koza's Automatically Defined Functions (ADFs) are: [4 pts]

    (a) the application of GP to automate the creation of functions in computer programs
    (b) the standard method of evolving reusable components in GP
    (c) the use of GP to create functions with a high AI ratio

    Select one of:

    - a
    - b
    - c
    - a and b
    - a and c
    - b and c
    - a, b, and c
    - none of a, b, nor c

16. Say you want to purchase a new house and care most about maximizing square footage and minimizing price. You collect square footage data and pricing on ten different houses and then you normalize both the square footage data and the pricing which results in the following table, where higher square footage numbers indicate greater square footage and higher affordability numbers indicate lower price:

ID	Square footage	Affordability
1	4	3
2	7	6
3	1	10
4	8	3
5	2	4
6	10	2
7	3	6
8	3	1
9	5	5
10	6	1

(a) List for each element which elements it dominates; indicate elements with their IDs. [4 pts]

(b) Show the population distributed over non-dominated levels, like some multi-objective EAs employ, after each addition of an element, starting with element 1 and ending with element 10 increasing the element number one at a time; indicate elements with their IDs. So you need to show ten different population distributions, the first one consisting of a single element, and the last one consisting of ten elements. [12 pts]