Name: _____

The questions in each section refer specifically to the associated reading printed in **bold**. Mark the best answer by filling in the circle next to it. Explanatory comments will not be considered.

The **real** exam is worth 15% of your final grade for this course, and contains 25 questions each equally weighted (1 point each). The exam period is 50 minutes. This sample exam has fewer questions.

Mitchell, M., Chapter 1: What is Complexity?

1. (1 point) Which of the following is not a complex adaptive system:
    ○ ant colonies.
    ○ the Brain. the World Wide Web.
    ○ a hurricane.
    ○ the immune system.

Mitchell, M., Chapter 2: Dynamics, Chaos, and Prediction

2. (1 point) $x_{t+1} = rx_t(1 - x_t)$ is called the:
    ○ propulsion map.
    ○ complex map.
    ○ logistic map.
    ○ Coulomb map.
    ○ adaptive map.

Mitchell, M., Chapter 3: Information

3. (1 point) Shannon's definition of information is sometimes characterised as:
    ○ the average amount of surprise in a message.
    ○ the length of the message.
    ○ the symbol diversity.
    ○ not having an agreed upon definition.
    ○ a complex transform of the thermodynamic depth.

Mitchell, M., Chapter 4: Computation

4. (1 point) Who formulated a solution to the Entscheidungs problem:
   - ◯ Leibniz.
   - ◯ Turing.
   - ◯ Gödel.
   - ◯ Mitchell.
   - ◯ Korek.

Mitchell, M., Chapter 5: Evolution

5. (1 point) Which of the following is not in Darwin's theory of natural selection:
   - ◯ Species descend from a common ancestor.
   - ◯ Requires competition.
   - ◯ Triats are inherited with variation.
   - ◯ Traits developed by an individual during its lifetime are inherited.
   - ◯ Evolutionary change is constant and gradual.

Mitchell, M., Chapter 6: Genetics, Simplified

6. (1 point) Which of the following is a DNA molecule:
   - ◯ Iron
   - ◯ Polysaccharide
   - ◯ Brontosine
   - ◯ Thymine
   - ◯ None of the above.

Mitchell, M., Chapter 7: Defining and Measuring Complexity

7. (1 point) Which of the following is discussed by Mitchell as a measure of complexity:
   - ◯ Data Supposition Complexity (DSC)
   - ◯ Algorithmic Information Content (AIC)
   - ◯ Component Transparency Analysis (CTA)
   - ◯ Lorenz Complexity Analysis (LCA)
   - ◯ the Machine Order Method (MOM)

Mitchell, M., Chapter 8: Self-Reproducing Automata

8. (1 point) Who first proved that self-reproducing automata could exist:
   - ◯ Alan Turing
   - ◯ John von Neumann
   - ◯ Edward Lorenz
   - ◯ Charles Darwin
   - ◯ Stephen Wolfram

Mitchell, M., Chapter 9: Genetic Algorithms

9. (1 point) What is Robby the Robot:

  ○ a paradox.

  ○ a self-reproducing robot built by Jon von Neumann.

  ○ a example to illustrate GAs.

  ○ a character in "Lost in Space"

  ○ None of the above.

Mitchell, M., Chapter 10: Cellular Automata, Life, and the Universe

10. (1 point) How many classes of CA does Wolfram define:

  ○ 1

  ○ 2

  ○ 3

  ○ 4

  ○ 5

Mitchell, M., Chapter 11: Computing with Particles

11. (1 point) What is majority classification:

  ○ a task in which the majority is classified based on a Turing machine.

  ○ computation performed by a CA in which it must decide whether its initial input was mostly 1s or 0s.

  ○ a voting system suggested by Wolfram's CA classifications.

  ○ an evolved CA which can always decide which of two populations is the majority.

  ○ a computation performed by a GA in which is must decide whether the output is true.

Project 1: Dynamical Systems

12. (1 point) You were asked to use which value to determine whether a system was chaotic:

  ○ Hawking's constant.

  ○ Feigenbaum's constant.

  ○ Lord May's constant.

  ○ The fractal dimension.

  ○ The Lyapunov exponent.

Project 2: Genetic Algorithms

13. (1 point) Which of the following crossover methods were you required to implement:

  ○ No crossover, uniform crossover, and 1-point crossover.

  ○ No crossover, 1-point crossover, and 2-point crossover.

  ○ Tournament crossover, roulette crossover, and uniform crossover.

  ○ No crossover, tournament crossover, and roulette crossover.

  ○ No crossover, tournament crossover, uniform crossover, and 1 and 2-point crossover.