Name:

Student ID #:

- You are expected to work on this assignment on your own
- Use pseudocode, Python-like or English to describe your algorithms. Absolutely no C++/C/Java
- When designing an algorithm, you are allowed to use any algorithm or data structure we explained in class, without giving its details, unless the question specifically requires that you give such details
- Always remember to analyze the time complexity of your algorithms
- Homework has to be submitted electronically on Gradescope by the deadline. No late assignments will be accepted
Problem 1. (0 points) Go to Gradescope (https://gradescope.com/ or follow the link from the class CS 218 webpage) and sign up using the entry code MJ8N56. Please make sure you type your name (as it is shown in the UC Riverside records) and student ID correctly in Gradescope. Once you have completed this homework, submit the PDF via Gradescope by January 15th, 2020, 11:59pm.
Problem 2. (10 points) Give a tight bound (using the big-theta notation) on the time complexity of following method as a function of $n$. For simplicity, you can assume $n$ to be a power of two.

Algorithm WeirdLoop ($n : \text{integer}$)

```
  $i \leftarrow n$
  while $i \geq 1$ do
      for $j \leftarrow 1$ to $i$ do
          $k \leftarrow 1$
          while $k \leq n$ do
              $k \leftarrow 2k$
          $i \leftarrow i/2$
```

Answer:
Problem 3. (10 points) You are given an array $A$ of size $n$ which contains integers in the range $[0, n - 1]$. Give a $O(n)$-time algorithm that prints all integers that appear more than once in $A$, using only $O(1)$ additional memory space. Note that since you can use only constant additional space, the use of external data structures or hash tables is not allowed.

Answer:
Problem 4. (10 points)

Given the following recurrence relation

\[ T(n) = \begin{cases} 
1 & n = 1 \\
T\left(\frac{n}{4}\right) + \sqrt{n} & n > 1 
\end{cases} \]

1. Solve it exactly (i.e., without using any asymptotic notation) by iterative substitutions

2. Prove by induction that your solution is correct

Answer: