

CISS350: Data Structures and Advanced Algorithms
Quiz q10401

Name: YOUR EMAILScore:

Q1. You want to sort an array of size n (which is ≥ 1000000000) of integer value in the range 0..9. You want the fastest sorting algorithm. Complete the following function to essentially perform a counting sort on x .

ANSWER:

```
// Sort x[0..n-1]
void sort(int x[], int n)
{
}
```

Q2. You want to sort an array of size n (which is ≥ 1000000000). of integer value in the range 100000..100020. The device is memory-constrained – besides the input array, you can afford to use at most the equivalent of 100 integers for your computations (for variables). Complete the following function to essentially perform a counting sort on x .

ANSWER:

```
// Sort x[0..n-1]
void sort(int x[], int n)
{
}
```

Q3. You want to sort an array of size n (which is ≥ 1000000000) and contains double values -5.0, -4.5, -4.0, -3.5, -3.0, ..., -0.5, 0.0, 0.5, ..., 4.5, 5.0. The device is memory-constrained – besides the input array, you can afford to use at most the equivalent of 100 integers for your computations (for variables). Complete the following function to essentially perform a counting sort on x .

ANSWER:

```
// Sort x[0..n-1]
void sort(double x[], int n) // correction: int x[] should be double x[]
{
}
```

Q4. Given a string, you want to return the character which appears most frequently in the string. For instance if the most frequently occurring character in "hello world" is 'l'. Use the idea from `countingsort` to count the number of times a character occurs in a string s and then perform a max computation to compute the most

commonly occurring character in the given string.

ANSWER:

```
char most_common_char(char s[])
{
    int count[256]; // count[i] is the number of times char(i) occurs in s
}
```

INSTRUCTIONS

In the file `thispreamble.tex` look for

```
\renewcommand\AUTHOR{}
```

and enter your email address:

```
\renewcommand\AUTHOR{jdoe5@cougars.ccis.edu}
```

(This is not really necessary since alex will change that for you when you execute `make`.) In your bash shell, execute “`make`” to recompile `main.pdf`. Execute “`make v`” to view `main.pdf`.

Enter your answers in `main.tex`. In the bash shell, execute “`make`” to recompile `main.pdf`. Execute “`make v`” to view `main.pdf`.

For each question, you’ll see boxes for you to fill. For small boxes, if you see

```
1 + 1 = \answerbox{}
```

you do this:

```
1 + 1 = \answerbox{2}
```

`answerbox` will also appear in “true/false” and “multiple-choice” questions.

For longer answers that need typewriter font, if you see

```
Write a C++ statement that declares an integer variable name x.  
\begin{answercode}  
\end{answercode}
```

you do this:

```
Write a C++ statement that declares an integer variable name x.  
\begin{answercode}  
int x;  
\end{answercode}
```

`answercode` will appear in questions asking for code, algorithm, and program output. In this case, indentation and spacing is significant. For program output, I do look at spaces and newlines.

For long answers (not in typewriter font) if you see

```
What is the color of the sky?  
\begin{answerlong}  
\end{answerlong}
```

you can write

```
What is the color of the sky?  
\begin{answerlong}  
The color of the sky is blue.  
\end{answerlong}
```

A question that begins with “T or F or M” requires you to identify whether it is true or false, or meaningless. “Meaningless” means something’s wrong with the question and it is not well-defined. Something like “ $1 + 2 = 4$ ” is either true or false (of course it’s false). Something like “ $1+2 = 4?$ ” does not make sense.

When writing results of computations, make sure it’s simplified. For instance write 2 instead of $1 + 1$.

HIGHER LEVEL CLASSES.

For students beyond 245: You can put L^AT_EX commands in `answerlong`.

More examples of meaningless statements: Questions such as “Is $42 = 1+2$ true or false?” or “Is $42 = \{2\}^{\{3\}}$ true or false?” does not make sense. “Is $P(42) = \{42\}$ true or false?” is meaningless because $P(X)$ is only defined if X is a set. For “Is $1 + 2 + 3$ true or false?”, “ $1 + 2 + 3$ ” is well-defined but as a “numerical expression”, not as a “proposition”, i.e., it cannot be true or false. Therefore “Is $1 + 2 + 3$ true or false?” is also not a well-defined question.

More examples of simplification: When you write down sets, if the answer is $\{1\}$, do not write $\{1, 1\}$. And when the values can be ordered, write the elements of the set in ascending order. When writing polynomials, begin with the highest degree term.

When writing a counterexample, always write the simplest.