CISS350: Data Structures and Advanced Algorithms
Quiz q10705

Name: YOUR EMAIL Score:

The following is the node for the binary search tree.

```
class BSTNode
{
public:
    int key_;
    BSTNode * parent_;
    BSTNode * left_, * right_;
};
```

Q1. Complete the following function to insert `key` into a BST. For simplicity, assume that `key` is not in the BST.
Answer:

```
void bst_insert(BSTNode ** p, int key)
{
    if (*p == NULL)
    {
    }
    else
    {
    }
}
```

For the following questions, to describe this BST

```
           (10)
         /      \
      ( 4)        (25)
     /           /    \
 ( 1)        (12)      (27)
                          \
                           (29)
```

in text, write

```
[10, [4, 25]]
[4, [1, None]]
[25, [12, 27]]
[1, [None, None]]
[12, [None, None]]
[27, [None, 29]]
[29, [None, None]]
```

Q2. What is the height of an empty tree?
Answer:

```
?
```

Q3. What is the height of this tree?

Answer:

```
?
```

Q4. Let T be a BST with values $1, 4, 10, 12, 25, 27, 29$ with the *smallest* possible height. Describe T in text (see above on how to describe a BST in text)
Answer:

```
?
```

Q5. List the least number of key(s) that when deleted from this BST

will make the resulting BST unbalanced. If you need to delete more than one key, list the keys in ascending order and separate by commas. If there are many ways to make this BST unbalanced, choose the key(s) that comes first in the dictionary order. For instance if you think deleting $12, 25$ and $12, 27$ will make the BST unbalanced, you should enter $12, 25$.

Answer:

?

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 LaTeX 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.