

Summer 2020 COP 3502 Section 2 Final Exam - Part B Solution

1) (10 pts) Write a recursive function that counts and returns the number of nodes in a binary tree with the root `root`, that store an even value. Please use the struct shown and function prototype shown below. (For example, if the tree rooted at `root` stored 2, 3, 4, 8, 13, 18 and 20, the function should return 5, since there are five even values [2,4,8,18,20] stored in the tree.

```
typedef struct node {
    int data;
    struct node* left;
    struct node* right;
} node;

int numEvenNodes(node* root) {

    if(root == NULL) return 0;

    int res = 0;
    if (root->data%2 == 0) res++;

    return res + numEvenNodes(root->left) +
                numEvenNodes(root->right);
}
```

Grading: 2 pts null case, 2 pts appropriately dealing with root node, 2 pts each recursive call, 1 pt adding, 1 pt return

2) (5 pts) Consider inserting the following values into a min heap, in this order: 12, 3, 19, 2, 1. Show the final locations for each value in the array storing the heap. (Recall that we store heaps in arrays using 1-based indexing and typically leave the 0 index blank.) Note: Only the answer will be graded for this question.

index	1	2	3	4	5
value	1	2	19	12	3

Grading: 1 pt each slot, all or nothing

3) (10 pts) Write a function that takes in a root node of a trie and returns the length of the longest word stored in that trie. Use the struct given and function prototype given below.

```
typedef struct trienode {
    int isWord;
    struct trienode* next[26];
} trienode;

int maxWordLength(trienode* root) {

    if (root == NULL) return -1;

    int bestkid = -1;
    for (int i=0; i<26; i++) {
        int thiskid = maxWordLeft(root->next[i]);
        if (thiskid > bestkid) bestkid = thiskid;
    }

    return bestkid+1;
}
```

Grading: 2 pts base case, 2 pts loop to 26, 3 pts rec call, 2 pts update max, 1 pt return (Note: This is a hard question so if they are off by 1 and set both the base case to 0 and bestkid to 0, don't take off any credit. This is an error that's pretty easy to debug with a compiler.)