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File: Sample Midterm and Final Exam Questions, Set 2

Computer Science 221

Practice Questions - Set 2

Linked Structures

Question 1

Suppose the nodes of a linked list structure are defined as following:

```
struct node
{
    int     value;
    node*   next;
};
```

Define a function `length` which takes as argument a linked list and returns the number of items that are in it. The function must leave its argument unchanged.

For instance, if `ls` is the list `(3,9,5,6)` then `length(ls)` returns `4` and `ls` is unchanged.

Question 2

Suppose the nodes of a doubly linked list structure are defined as:

```
struct node
 {
    int    item;
    node*  next;
    node*  prev;
 };
```

Write a function `concat` which concatenates two given lists (the first node of the second list will follow the last node of the first list) and returns the new list. Note that `concat` does not create new nodes; it just rearranges the links of some existing notes.

```
node* concat( node* list1, node* list2 )
{
```

Question 3

Suppose the nodes of a linked list structure are defined as in Question 2. Define a function `add_ordered` that takes a new item and a list whose items are kept in increasing order and inserts the new item in the right place in the list (so, the items in the list are in increasing order after the insertion).

For instance, if `ls` is the list `(3,5,6,9)`, then after `add_ordered(ls,8)`, `ls` becomes `(3,5,6,8,9)`

Question 4

Suppose the nodes of a binary tree structure are defined as follows:

```
struct node {
   int   value;
   node* left;
   node* right;
};
```

Define a function `count` which takes as argument a binary tree and returns the number of nodes that are in the tree. The function must leave its argument unchanged.

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