EE 453/717: Advanced Computing for Electrical Engineers

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Code B

Quiz 1 : **15 points** **Duration**: 80 minutes

Each of the following questions is worth 5 points.

1. Consider two singly linked lists of integers whose elements are sorted in ascending order. Their lengths can be different and they can also be empty. If a list is nonempty, the last node in it points to `NULL`. Write a C++ function which takes the pointers to the first nodes of these two sorted linked lists as inputs and returns a pointer to the first node of a linked list which contains the integers from the both the lists in ascending order. The signature of the function should be the following: `node* JoinLists(node* a, node* b);` where the definition of `node` is the following

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

2. Consider the circular linked list $2 \to 3 \to 4 \to 5 \to 6 \to 7 \to 8 \to 2$. Each element in the list is of type `node` given in the first question. Suppose the pointer to the `node` containing 2 is passed as the first argument to the following function. If the second argument is 5, draw the state of the linked list every time "State of List" is printed. What is the integer which is printed at the end of the function?

```
void doSomething(node *x, int M)
{
    while (x != x->next)
    {
        cout << "State of list" << endl;
        for (i = 1; i < M; i++)
            x = x->next;
        x->next = x->next->next;
    }
    cout << x->item << endl;
}
```

3. Implement a stack using a queue. Consider the `Stack` class below which contains a queue as private data. Assume that the `Queue` class contains the methods `Size()`, `Add(T x)` and `T Remove()`. Fill in the implementations of the `public` methods shown.

```
template<class T>
class Stack {
   private:
      Queue<T> q;

   public:
      void Push(T x);
      T Pop();
};
```