Time: 2 Hours | **CS211 – Data Structures** | Total Marks: 50

Name: | Midterm Exam – May 22 | Reg No:

Q1: {3+3+2+2=10}

a. *What is the exact time-complexity of the given code in terms of n?*

```
for (int i=1; i<=n*n; i=i+3);
```

b. *What is the exact time-complexity of the given code in terms of n?*

```
for (int i=1; i<n; i=i+1)
  for (int j=i; j<=n; j=j+3);
```

c. *Which algorithm from parts (a) and (b) is more efficient and for which values of n?*

d. *In which scenarios insertion sort is better than selection sort and vice-versa. Discuss why?*

Q2: {2+3+3=8}

a. *What is the difference between* `ate` *and* `app` *flags in fstream?*

b. *What are command line arguments? Explain their usage with the help of a small example.*

c. *While reading and displaying records (structures) from a binary file, the last record is displayed twice. What is the reason for it? How can we prevent it?*

Q3: Given the following code for array based stack: {3+3=6}

- **a.** *Make it generic using templates. Use the given code, do not write code again.*
- **b.** *Used const at suitable places. Use the given code, do not write code again.*

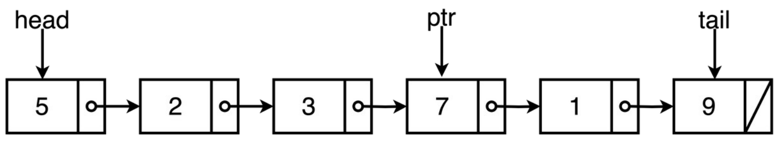
```
class        stack        {

private:

        int        SIZE;

        int        TOP;

        int        *data;

public:

        stack(      int        size        =        100)        ;

        stack(      stack        &src)        ;

        void        operator=(        stack        &src)        ;

        bool        operator<(        stack        &rhs)        ;

        ~stack(        );

        void        push(        int        &val)        ;

        int         top(        )        ;

        void        pop(        )        ;

        bool        empty(        )        ;

        bool        full(        )        ;

        void        make_empty(        )        ;

        int         size(        )        ;

};
```

Q4: *What would be the output of the code? In case of an error, mention it.* *{8}*

```
stack<int> s; queue<int> q; list<int> t;
s.push(2); s.push(5); s.push(7); s.push(4);
q.push(s.top()); q.push(s.top()); q.push(s.top()); q.push(s.top());
s.empty();
while(!q.empty()) {
    if (s.top()%2 == 0)
        t.push_back(q.front());
    else
        t.push_front(s.top());
    q.pop();
    s.pop();
    if (s.empty())
        break;
}
while(!t.empty()) {
    if (t.front()%2 == 0)
        cout<<t.front()<<" ";
    else
        cout<<t.back()<<" ";
    t.pop_back();
}
```

Q5: Convert the following expression into postfix notation: `6+7-4*2/3` {8}

Q6: For this question, write code based on the following linked structures and pointers to the nodes. Write independent code for each part. {1+2+3+4=10}



a. Display the value 1.

b. Display all the values between 5 and 7 using a loop, without comparing the data part.

c. Create a new node, store value 4 in it and insert it after the node with value 1.

d. Swap the nodes with values 5 and 2 (swap whole nodes, not just their data parts).

Extra Sheet

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