The public test of Task 7 is:

```
SparseTuringMachine s;
TuringMachineState s1(1,2,3,4,"->");
s.add(s1);
TuringMachineState s2(5,6,7,8,"<-");
s.add(s2);
cout << *s.find(1,2);
cout << *s.find(5,6)<<endl;
cout << (s.find(1,3)==NULL)<<endl;
vector<TuringMachineState> vec=*s.getAll();
sort(vec.begin(),vec.end(),compareState);
for (auto t: *s.getAll()) cout << t;
MenuSystem m;
m.menu();
```

where:

```
bool compareState(TuringMachineState s1, TuringMachineState
s2) {
     return
(s1.getCurrentState()<s2.getCurrentState())|||(s1.getCurrentSt
ate()==s2.getCurrentState())&&s1.getCurrentContent()<s2.getCur
rentContent());
}
```

There are two public test runs:

First input:

```
50
2
3
0 0 1000000 1000000 ->
3
0 1000000 0 0 <-
3
1000000 0 2000000 1000000 ->
3
2000000 0 0 0 <-
4
6
5
5
6
q
```

The expected output is (the input above is inserted below in red to make it clearer – the output is not expected to contain it):
1 2 3 4 ->5 6 7 8 <-
1
1 2 3 4 ->5 6 7 8 <-

How long should the tape be?
50
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
2
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
3
What state do you wish to add?
0 0 1000000 1000000 ->
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
3
What state do you wish to add?
0 1000000 0 0 <-
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option

3
What state do you wish to add?
1000000 0 2000000 1000000 ->
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
3
What state do you wish to add?
2000000 0 0 0 <-
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
4
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
6
The current state is 0.
The current position is 0.
The content of the tape is 0.
The Turing machine has states: <0 0 1 1 ->> <0 1 0 0 <-> <1 0 2 1 ->> <2 0 0 0 <->
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
5
How many steps do you wish to execute?
5

1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
6
The current state is 0.
The current position is -1.
The content of the tape is 000.
The Turing machine has states: <0 0 1 1 ->> <0 1 0 0 <-> <1 0 2 1 ->> <2 0 0 0 <->
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
q

Second input:

50
2
3
0 0 1000000 1000000 ->
3
0 1000000 0 0 <-
3
1000000 0 2000000 1000000 ->
3
2000000 0 0 0 <-
6
5
1
6
5
4
6
q

The expected output is (the input above is inserted below in red to make it clearer – the output is not expected to contain it):
1 2 3 4 ->5 6 7 8 <-
1
1 2 3 4 ->5 6 7 8 <-

How long should the tape be?
50
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
2
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option

3
What state do you wish to add?
0 0 1000000 1000000 ->
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
3
What state do you wish to add?
0 1000000 0 0 <-
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
3
What state do you wish to add?
1000000 0 2000000 1000000 ->
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
3
What state do you wish to add?
2000000 0 0 0 <-
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
6
The current state is 0.
The current position is 0.

The content of the tape is 0.
The Turing machine has states: <0 0 1000000 1000000 ->> <0 1000000 0 0 <-> <1000000 0 2000000 1000000 ->> <2000000 0 0 0 <->
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
5
How many steps do you wish to execute?
1
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
6
The current state is 1000000.
The current position is 1.
The content of the tape is 10000000.
The Turing machine has states: <0 0 1000000 1000000 ->> <0 1000000 0 0 <-> <1000000 0 2000000 1000000 ->> <2000000 0 0 0 <->
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
5
How many steps do you wish to execute?
4
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option

6
The current state is 0.
The current position is -1.
The content of the tape is 000.
The Turing machine has states: <0 0 1000000 1000000 ->> <0 1000000 0 0 <-> <1000000 0 2000000 1000000 ->> <2000000 0 0 0 <->
1. Create dense Turing machine
2. Create sparse Turing machine
3. Add state to Turing machine
4. Compact Turing machine
5. Execute Turing machine
6. Output current information
Write q or Q to quit
Enter Option
q