90-1

1.(10%)Implement the Boolean function F(A, B, C)=Σ(1, 2, 6,7) with a 4-to-1-line multiplexer and a NOT gate.

2. Give an analysis of the running time (Big-Oh) for each of the following four program fragments:
(a) (2%)sum=0;
```
        for (i=0; i<n; i++)
             for (j=0; j<n; j++) sum++;
```
(b)(3%) sum=0;
```
        for (i=0; i<n; i++)
             for (j=0; j<i; j++) sum++;
```
(c)(5%) sum=0;
```
        for (i=0; i<n; i++)
           for (j=0; j<i×i; j++)
             for(k=0; k<j; k++) sum++;
```
(d)(5%) sum=0;
```
        for (i=1; i<n; i++)
           for (j=1; j<i×i; j++)
             if (j % i ==0)
                 for(k=0; k<j; k++) sum++;
```

3.(5%)A is a two dimensions array. If A(2,3) is in location 1756 and A(3,3) is in the location 1760, each element occupies one Byte. Where is the location of A(4,4).

4.(10%) Use operations PUSH, POP, and NO-OP(i.e. forward the input to the output directly) to rearrange an input sequence: A,B,C,D, Write the rearrangements that can **not** be generated.

5. (12%)Find one binary tree except one node tree and empty tree whose nodes appear in exactly the same sequence in both：(a)preorder and inorder；(b)inorder and postorder; (c) inorder and level order.

6 (10%)Using the following input sequence：5,6,4,3,7,1,8,2,9；(a)Create a **max** heap；(b) Create a binary search tree.

7. (10%) Under what condition(s) will the bubble sort run faster than the quick sort?

8.(8%)Give an example where Dijkstra's algorithm gives the wrong answer in the presence of a negative edge but no negative-cost cycle.

9. (10%)If all of the edges in a graph have weights between 1 and $|E|$, how fast can the minimum spanning tree be computed? $|E|$ is the number of edge in the graph.

10.(10%)One form of the knapsack problem is as follows: We are given a set of integers $A=a_1, a_2, ..., a_N$ and an integer K. Is there a subset of A whose sum is exactly K? Give an algorithm that solves the knapsack problem in $O(NK)$ time.