1. For the following number list, perform a selection sort and show the list after each iteration. How many comparisons and swaps of elements are made when the list is sorted? (10%)

17	23	14	6	8

2. Perform the binary addition operation of the two decimal signed integers –300 and +254 using two's complement representation. Show the process in details. (10%)

3. Draw a state diagram for a Turing machine that increments a binary number. Two examples are given below. (10%)

0100 => 0101
0111 => 1000

4. Build a circuit using AND, OR, and NOT gates to implement the following truth table. (10%)

a	*b*	*c*	*Output*
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

5. If we have a depth-first traversal of a tree's pre-order and in-order as following:
   pre-order: F, B, A, D, C, E, G, I, H;
   in-order: A, B, C, D, E, F, G, H, I
   Please draw this binary tree. (10%)

6. If a 4-bit sequence is 1011, find out the Hamming code after adding 3 parity bits to recover from 1 bit errors. (10%)

7. Consider a simple grammar below, show how sentences can be derived by a series of replacements. Expressed this grammar as a parse tree. (10%)

<sentence> ::= <noun-phrase> <predicate>
<noun-phrase> ::= <article> <noun>
<article> ::= **the | a | an**
<noun> ::= **cat | flower**
<predicate> ::= **jumps | blooms**

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8. For each of the following pairs of terms, explain each term, making sure to identify the similarities (if any) and the key differences between the two terms.
   (a) "DNS" and "ARP" (4%)
   (b) "IPv4 address" and "MAC address" (3%)
   (c) "Internet checksum" and "Cyclic Redundancy Check (CRC)" (3%)

9. A segment of 8086 assembly program is shown below.

```
        MOV   CX, 1000H
DLY:    DEC   CX
        NOP
        JNZ   DLY
NXT:    ---   ---
```

   Answer the following questions:
   (a) Describe the operations performed by the above operations. (4%)
   (b) How many times does the JNZ DLY instruction get executed? (3%)
   (c) What instruction needs to be changed if we want the let JNZ DLY to be executed 20 times. Write down the new instruction. (3%)

10. Write a simple program function for binary search in any high-level programming language. Wrap a main program to search an element in a sorted integer array using the binary search function. (10%).

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