1. (15 points) Show the number −5 by 8-bit binary codes using the twos-complement representation. Also give an example to explain the problem of overflow.

2. (15 points) Give the full names of the following acronyms:
CPU, RAM, WWW, URL, http.

3. (20 points) Convert the following infix expression into a postfix expression:
$$(2 + 3 * 5) * (8 - 3 - 2) * 5 + 3.$$
Also briefly describe how to evaluate postfix expressions.

4. (15 points) Let A be an adjacent matrix for a simple graph G = (V, E), where V={1, 2, ..., n}, and A[i, j] = 1 if node i and node j are adjacent, where $1 \le i \ne j \le n$. Otherwise, A[i, j] = 0. Describe briefly how to determine whether or not given any two distinct nodes i and j there is a path connecting these two nodes. And find a shortest path if they are connected. Give necessary data structures in order to get credits.

5. (15 points) Given a C programming data structure as the following,

```
struct node
{   int value;
    struct node *left, *right;
}
```

design a recursive C function (or a recursive function in some other programming languages) to find the total number of leaves of a binary tree. The heading of the definition of the function is as follows:

`int total_leaves(struct node *np).`

The call `total_leaves( rootnode )` by passing the root `rootnode` of a tree will return the total number of leaves of the tree.

6. (a)(10 points) Given a bipartite graph G=($V_1 \cup V_2$, E), where V_1 and V_2 are disjoint, show that the difference between the number of nodes of V_1 and V_2 is less than 2 if there is a Hamilton path in G.
(b)(10 points) Given a graph as follows, is there any Hamilton path in the graph? If there is one, then show it. Otherwise, explain why.