Note: You must show all of your work to obtain credit for a problem. Partial credit will be given when meaningful answers were given.

Questions:

1. (15 points) Do Exercise 5.1 (parts a through c only) on p. 237 of your textbook.

2. (15 points) Take \( m = 11, R = 5 \). Insert 23, 47, 28, 56, 50, 36, 15, using double hashing with hash functions \( h(x) = x \mod m, h^+(x) = R - (x \mod R) \), and \( f_i = i^2 h^+ \), into an initially empty hash table. Show both your work and the resulting hash table.

3. (15 points) Consider a binary tree \( T \) which has a maximum of 63 nodes.
   (a) (2 points) What is the height of \( T \)?
   (b) (2 points) What is the minimum number of leaves of \( T \)?
   (c) (2 points) What is the maximum number of leaves of \( T \)?
   (d) (4 points) Draw a skew tree that satisfies all of the above properties.
   (e) (5 points) Draw a balanced binary tree that is not a full binary tree but satisfies all of the above properties.

4. (15 points) Construct the (unique) binary tree corresponding to the given pair of tree traversals if possible. If no such tree is possible, state that is the case. You must show all of your steps as illustrated in class for credit.
   Postorder: \( H \ I \ B \ C \ A \ K \ G \ E \ J \ D \ F \)
   Inorder: \( I \ H \ C \ B \ K \ G \ J \ E \ F \ D \ A \).

5. (15 points) Prove by induction that the number of nodes in a binary tree of height \( h \) is at most \( 2^{h+1} - 1 \).

6. (15 points) Do Problem 4.6 on p. 183 of your textbook.

7. (15 points) Illustrate the data structure for the tree given below using the left-child list-of-siblings implementation. You must show all pointers and related structure(s) clearly to receive credit.