Problem 3:

For binary tree, the minimum number of rounds to broadcast a message to all nodes is equal to the height of the binary tree or height + 1(when height of left subtree = height of right subtree).

Algorithm

int sum\_round(Tree k)

{

int round = 0;

if (k) //Tree exists

{

int left\_tree = sum\_round(tree -> left); //Rounds of the left subtree

int right\_tree = sum\_round(tree -> right); //Rounds of the right subtree

if (left\_tree == right\_tree)

round = right\_tree + 2; //Height + 1 + root node

else

round = 1 + max(left\_tree, right\_tree); //Height + root node

}

return round;

}

Since the algorithm traverses all the nodes of binary tree once, the running time is O(n), n is the number of nodes in the binary tree.