HABIB UNIVERSITY

Data Structures & Algorithms

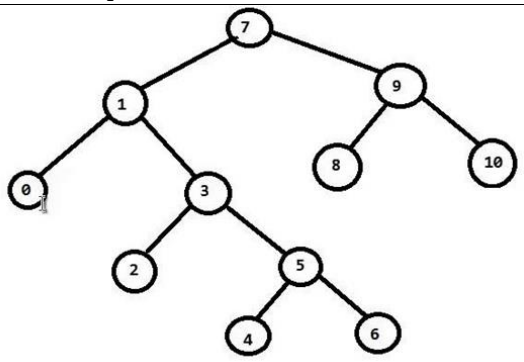
CS/CE 102/171 Spring 2023

Instructor: Maria Samad

Binary Tree Representation – Array-Based

Student Name: _____

For the given trees, define them using Array Based Representation (implemented using Lists), and answer the specified questions



Tree Representation:

T = [7, 1, 9, 0, 3, 8, 10, None, None, 2, 5, None, None, None, None, None, None, None, None, None, 4, 6, None, None, None, None, None, None, None, None]

Parent of Node 5 (Use formula on the list to evaluate):

Parent Position = floor[(f(p) – 1) / 2]
= floor[(10 – 1)/2]
= floor(9/2)
= floor(4.5)
= 4

Thus, Parent Node = Node 3

Left Child of Node 8 (Use formula on the list to evaluate):

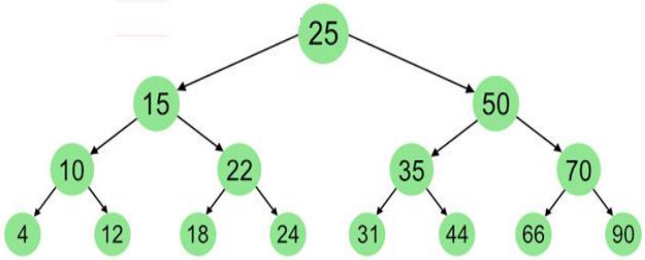
Left Child Position = 2f(p) + 1
= 2(5) + 1
= 10 + 1
= 11

Thus, Left Child = None i.e. no left child

Right Child of Node 9 (Use formula on the list to evaluate):

Right Child Position = 2f(p) + 2
= 2(2) + 2
= 4 + 2
= 6

Thus, Right Child = Node 10



Tree Representation:

T = [25, 15, 50, 10, 22, 35, 70, 4, 12, 18, 24, 31, 44, 66, 90]

Parent of Node 35 (Use formula on the list to evaluate):

Parent Position = floor[(f(p) – 1) / 2]
= floor[(5 – 1)/2]
= floor(4/2)
= floor(2)
= 2

Thus, Parent Node = Node 50

Left Child of Node 70 (Use formula on the list to evaluate):

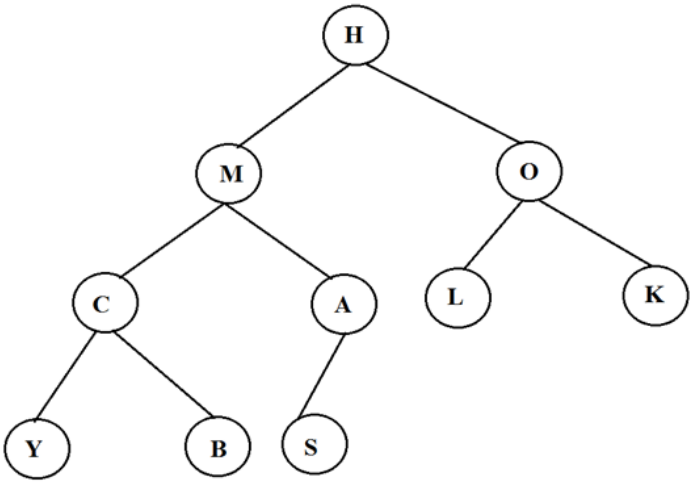
Left Child Position = 2f(p) + 1
= 2(6) + 1
= 12 + 1
= 13

Thus, Left Child = Node 66

Right Child of Node 25 (Use formula on the list to evaluate):

Right Child Position = 2f(p) + 2
= 2(0) + 2
= 0 + 2
= 2

Thus, Right Child = Node 50



Tree Representation:

T = [H, M, O, C, A, L, K, Y, B, S, None, None, None, None, None]

Parent of Node S (Use formula on the list to evaluate):

Parent Position = floor[(f(p) – 1) / 2]
= floor[(9 – 1)/2]
= floor(8/2)
= floor(4)
= 4
Thus, Parent Node = Node A

Left Child of Node O (Use formula on the list to evaluate):

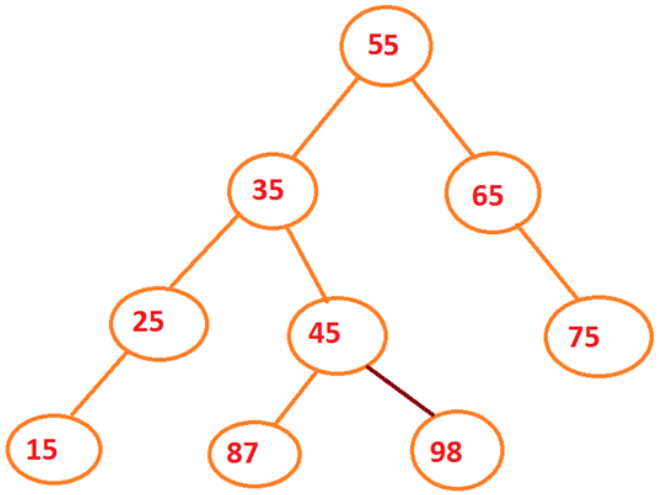
Left Child Position = 2f(p) + 1
= 2(2) + 1
= 4 + 1
= 5

Thus, Left Child = Node L

Right Child of Node C (Use formula on the list to evaluate):

Right Child Position = 2f(p) + 2
= 2(3) + 2
= 6 + 2
= 8

Thus, Right Child = Node B



Tree Representation:

T = [55, 35, 65, 25, 45, None, 75, 15, None, 87, 98, None, None, None, None]

Parent of Node 87 (Use formula on the list to evaluate):

Parent Position = floor[(f(p) – 1) / 2]
= floor[(9 – 1)/2]
= floor(8/2)
= floor(4)
= 4
Thus, Parent Node = Node 45

Left Child of Node 25 (Use formula on the list to evaluate):

Left Child Position = 2f(p) + 1
= 2(3) + 1
= 6 + 1
= 7

Thus, Left Child = Node 15

Right Child of Node 75 (Use formula on the list to evaluate):

Right Child Position = 2f(p) + 2
= 2(6) + 2
= 12 + 2
= 14

Thus, Right Child = None, i.e. no right child