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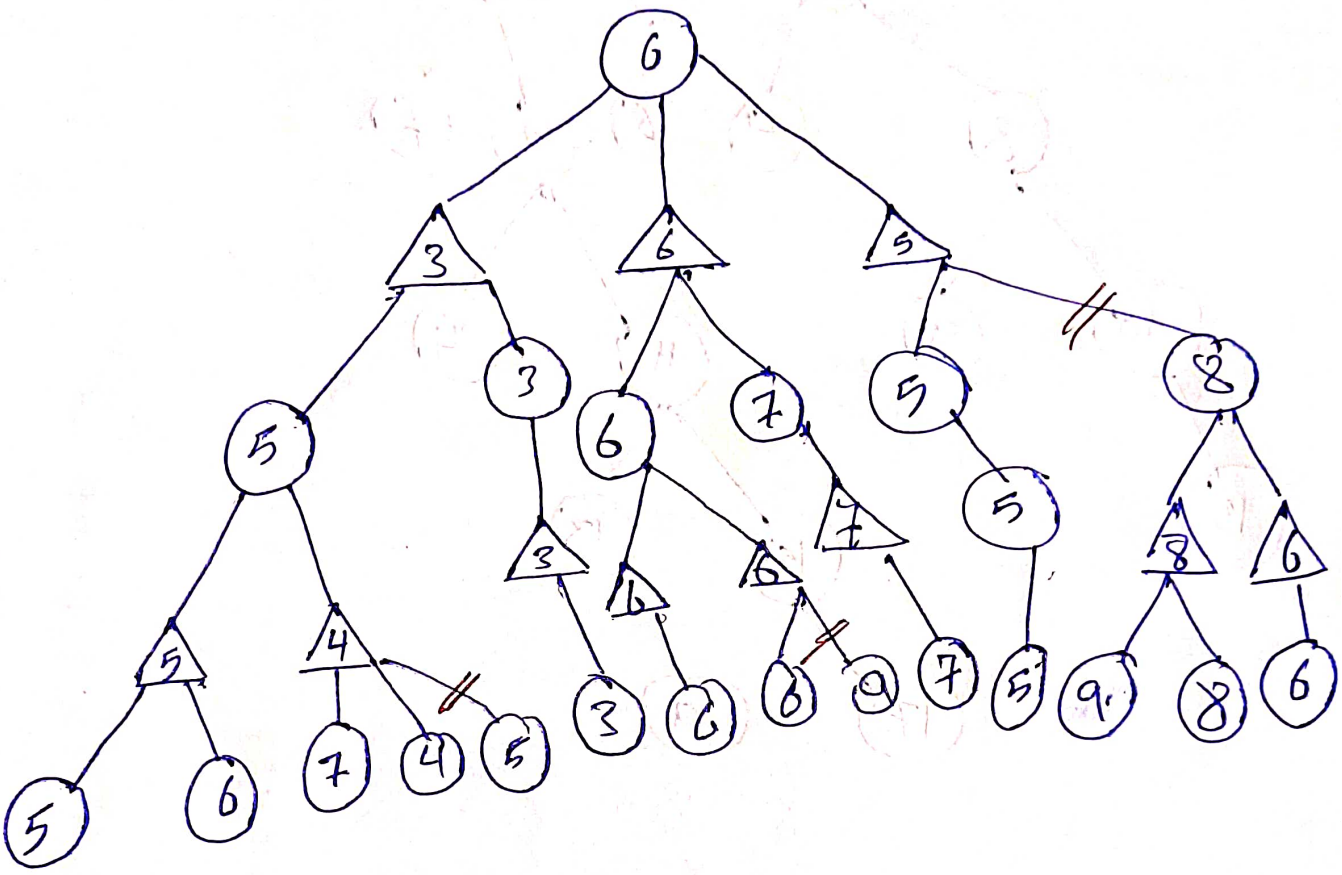
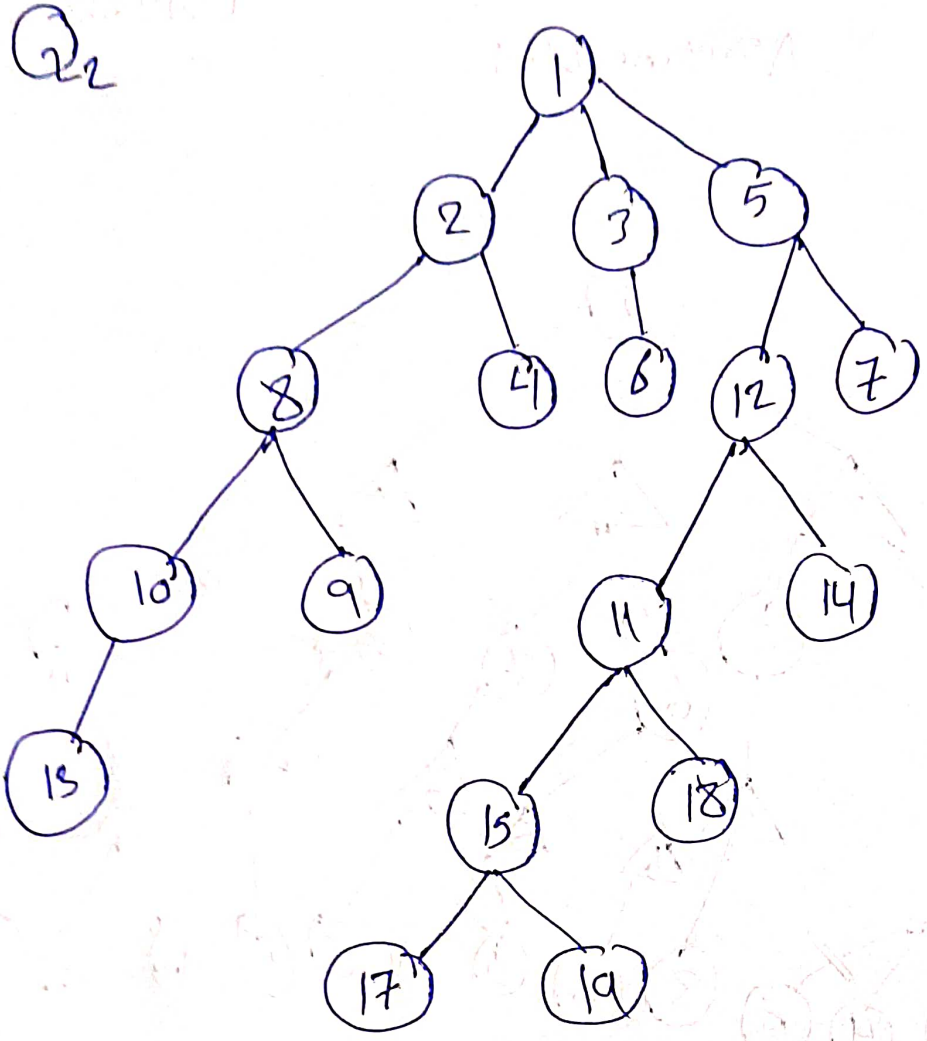
Assignment# 1

Q1:



Q2



Depth 1 : 1

Depth 2 : 1, 4, 9, 11

Depth 3 : 8, 15, 9, 4, 17, 11, 19

the maxium depth of the tree is equal to the number of empty cells in the puzzle which is 12 in this case

Q3.1

Starting state: [W, S, B, M] [ ]
Goal state : [ ] [W, S, B, M]

where W = wolf, S = sheep, B = Barley, M = Man
and [ ] denotes the riverbank

Search tree:

Depth 0:
[W, S, B, M] [ ]

Depth 2:
[S, B,] [W, M]
[S, , B] [W, M]
[W, S,] [B, M]
[, S, B] [W, M]
[W, , S] [B, M]

Depth 4:
[B,] [W, S, M]
[S,] [W, B, M]
[W, B, S] [M]
[W, , B] [S, M]
[W, S, B] [M]
[, S,] [W, B, M]
[, , B] [W, S, M]

Depth 6:
[, B] [W, S, M]
[, S] [W, B, M]
[, , W, S, B, M]

Solutions found : 2
Solution depth : 6

Q3.2

implementation in Python:

```
def f(x):
    return x**3 - 12*x + 3
def hill_climbing(start, step_size, max_iter):
    x = start
    for i in range(max_iter):
        next_x = x + step_size
        if f(next_x) > f(x):
            x = next_x
        else:
            next_x = x - step_size
            if f(next_x) > f(x):
                x = next_x
            else:
                break
return x
```

Q5:

1- Assign tentative distance values to each cell on the grid, with a distance value of zero for the source cell and infinity for all other cells.

2- Calculate the heuristic value for each cell on grid, using the Manhattan distance as the heuristic

3- Choose the cell with the lowest total value among all unvisited cells.

4- update the tentative distance values of the neighbors of the current cell, if a lower value can be found by going through the current cell.

5- Repeat 3.4 until the destination cell is reached or all cells have been visited

6- construct the shortest path by tracing back from the destination cell to the source cell, following the cells with the lowest distance value.