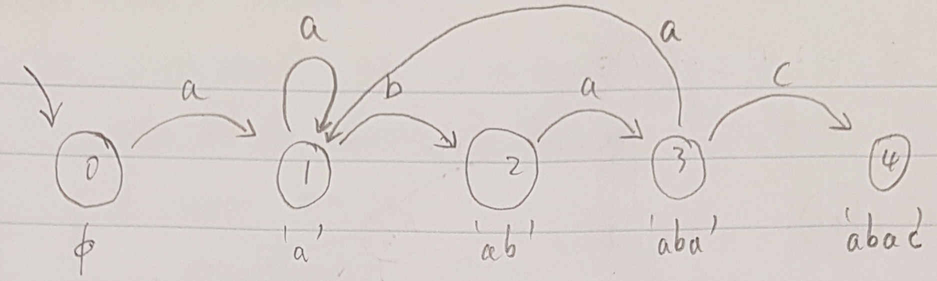
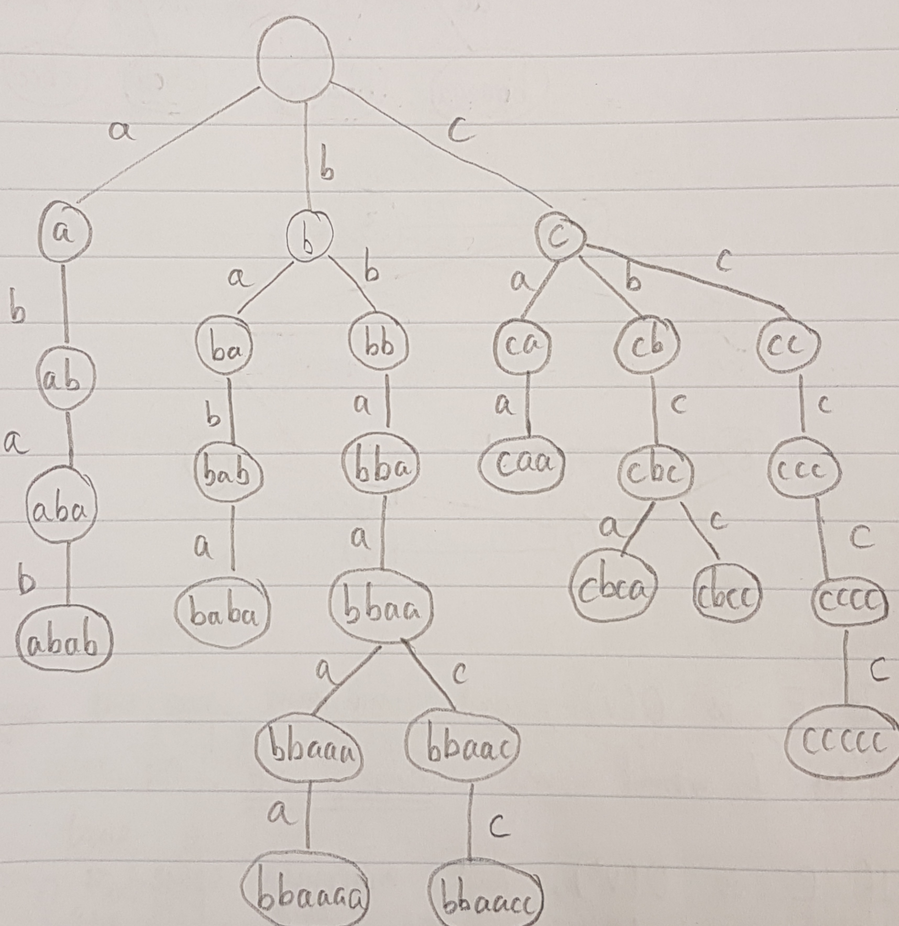
1. a)

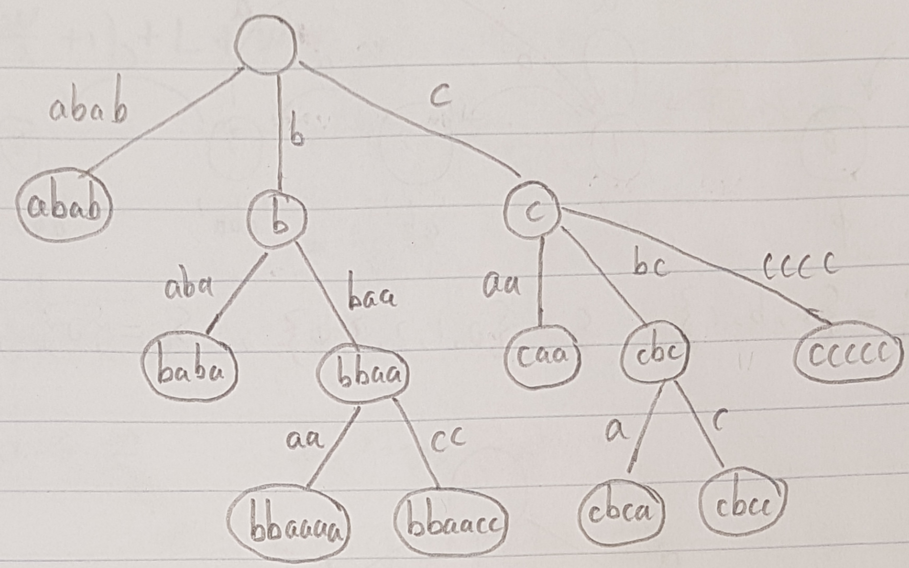


$\Sigma = \{a, b, c\}$, $S = \{0, 1, 2, 3, 4\}$, $S_0 = \{0\}$, $F\{7\}$

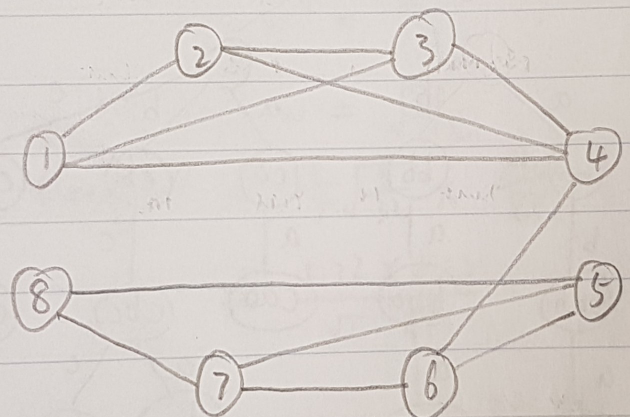
b)



c)



2. a)



b) If E is $O(V)$, and minimum space is required, then I would use <u>Edge List</u>.

If E is $O(V^2)$, and minimum space is required, then I would use <u>Edge List</u> or <u>Adjacency List</u>

If we care about adjacency time, then, I would use <u>Adjacency Matrix</u>.

```
vector < int > possible vertex ;
c)  for i = row 0 to i = row V
        sum all the elements in the row
        if sum == 0
            possiblevertex . push_back ( i )

    if possiblevertex is empty
        return "no universal sink"

    else
        for i = 0 to i = possiblevertex . length ( )
            sum all the elements in i th column .
            if sum == (V - 1)
                return "found universal sink"
    return "no universal sink"
```

3. a) n is even number

Because every vertex is connected to two other vertices.

Thus, one color for the vertex itself

and one color for its neighbors.

This is true for every n.

b) $n = [0, \infty)$

One color for the center node

and one color for all the other nodes.

c) $n = 2$ or n is odd

one color for the center node.
Then we can treat this graph as cycle graph with chromatic number 2
The two colors keeps alternating as long as the cycle graph has even number of nodes

d) There does not exist n that the chromatic number is 2 for Q_n
Because the chromatic number for Q_n is always 2

e) There does not exist n that the chromatic number is 2 for $K_{n,n}$
Because the chromatic number for $K_{n,n}$ is always 2.

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