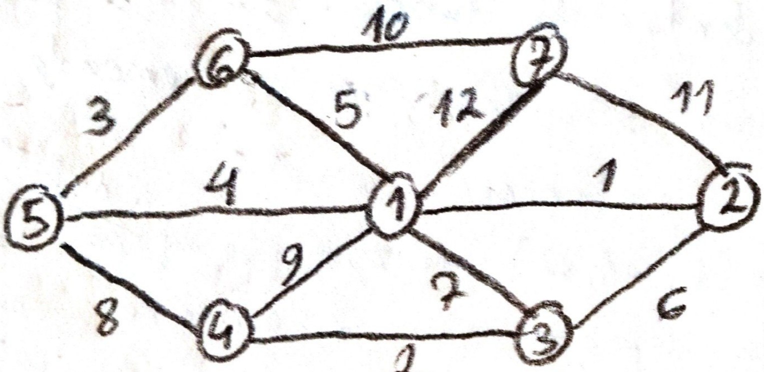
EN 2024

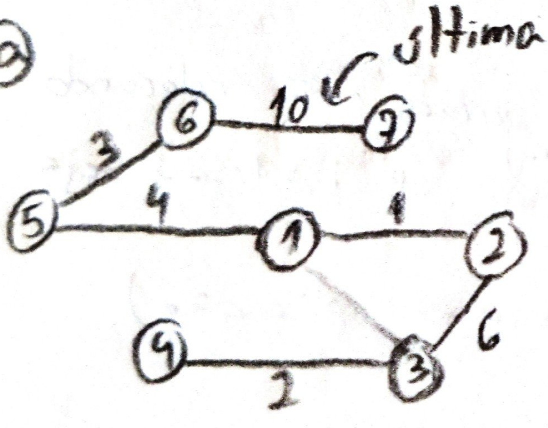
1.

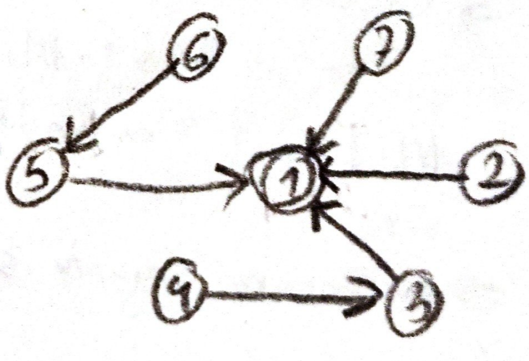
```
function C(n, cur, rem):
    if |cur| ≥ n/2
        print(cur)

    for i in 0, ..., |rem|
        add := rem[i]
        new_comb := cur ∪ {add}
        new_rem := rem[i+1 :]
        C(n, new_comb, new_rem)
```

2.

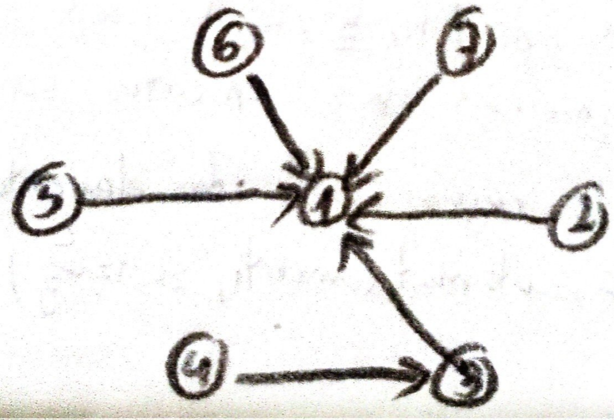


a)

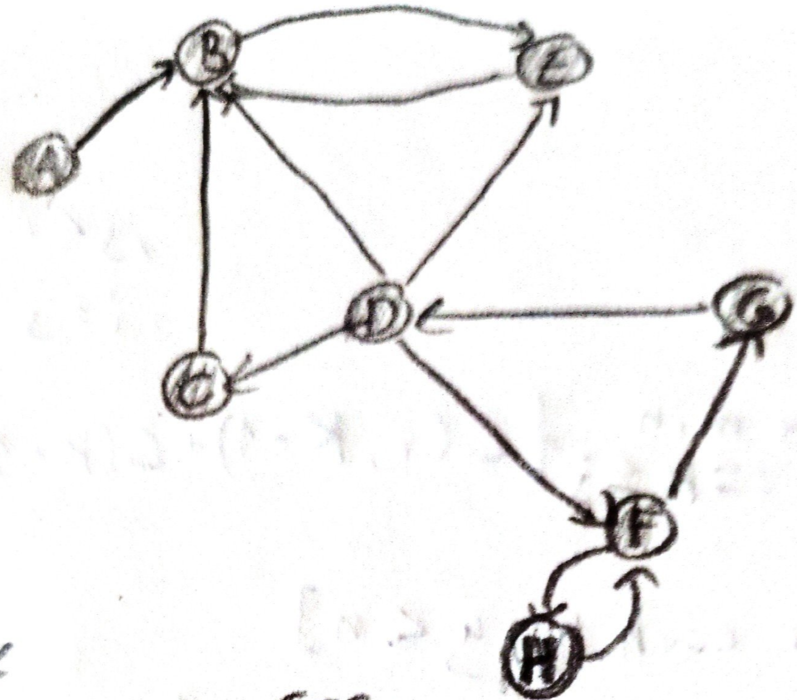




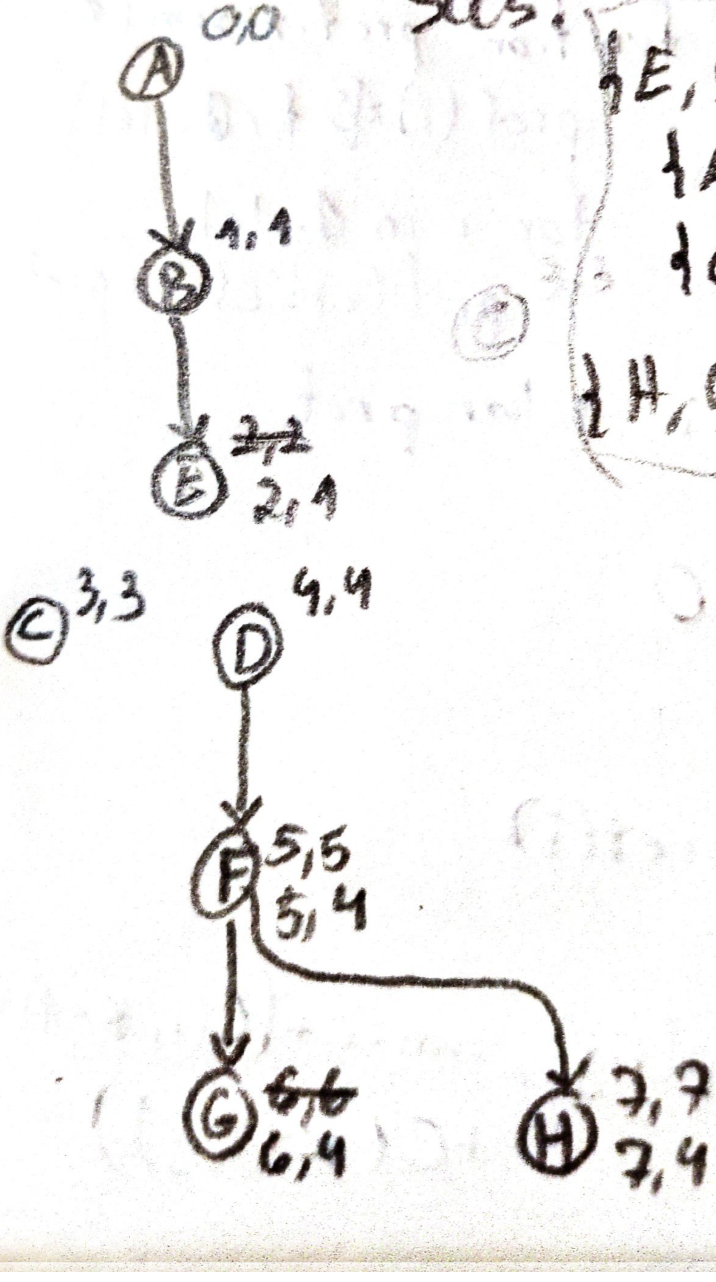
b)



3



DFS Tree



SCCs:

{E, B}

{A}

{C}

{H, G, F, D}

E
B
A

C

H
G
F
D

④ $i = 1, \dots, n$
$j = 1, \dots, n$
$c_i \geq 0$

$$C(i,j) = \begin{cases} 0 & , j < i \\ c_i & , i = j \\ \sum_{\ell=i}^{j} c_\ell + \min_{i \leq k \leq j} \{ C(i, k-1) + C(k+1, j) \} & , \text{else} \end{cases}$$

```
dp[x][y] = [-1 : for each x, y < n]

function C(i, j, pref):                  | function prefix-sum(c)
    if dp(i, j) ≠ -1:                    |     pref(i) = [0 for 0 .. |c|]
        return dp(i, j)                  |     for i in 1 .. |c|
    if i = j:                            |         pref(i) = c[i] + pref(i-1)
        return dp(i, j) := c_i           |     return pref
    if j < i:
        return dp(i, j) := 0
    else:
        dp(i, j) := ∞
        sum_c := pref(j) - pref(i)
        for k in i, ..., j:
            dp[i, j] = min(dp[i, j], sum_c + (C(i, k-1) +
                                            + C(k+1, j))
        return dp[i, j]

C(1, n, prefix-sum(c))
```