- 1) a. If we measure the size of an instance of the problem of computing the greatest common Livisor of m and n by the size of the second parameter n, by thow much can the size Lecrease after one iteration of Euclid's algorithm?
  - b.) Prove that an instance size will always decrease at least by a factor of 2 after two serccussive iterations of Euclid's algorithm. Let r=m mod n. Investigate two cases of is value radative to n's value.
  - a) gcd (m,n) = gcd (n,m mod h)
    - -> Euclid (a,b)

      if b==0

      return a

      else return Euclid (b, a mod b)

algoritma

3 recursive de bulunmustur

Her ravisce de 2 argumen besintible coalmattadir. Boynt n 1 ve n arasindo avalmattadir.

b.) 
$$gcd(m,n) = gcd(n,n) = gcd(r,n)$$

recursiveden sonna 2 text apalaragini tranflamani istemis gcd(m,n) = gcd(n,n) = gcd(r,n modr) boyutine of olmasi gerelin 10:  $\frac{n}{2}$  > n mod (n) Bu duram da n mod r icin iki falli durum olusur U wogu イレイジ Jahram JY LYN u mog L= U-L くら

Handy Ar

2. An algorithm which ensures that each new permutation is created by exchanging only two neighboring elements is called a minimal change algorithm Design a minimal change decrease by-one algorithm for generating permutations of a given set of indegers 1,2, --, n
Stein hour Johnson Trotter algorithms: (PSZen yara budim)

First the numbers 1-- n are written

132 in the increasing order ont a direction

312 is assigned to each of them which

321 is initially Left. Note that L symbol

231 in front of each number below indicates

213 that the direction associated with it is

Left.

Similary a number followed by > symbol would indicate that its direction is right.

This algorithm uses a term called mobile integer. An integer is said to be mobile, if the adjacent number on its direction is smaller than this

## Alapritma

The aborithm works by placing the number 1-- 1 in the increasing order and associating left L as the direction for each of them

Find the largest mobile and surp it with the adjacent element on its direction without changing the direction of any of those two. In doing so, if the largest mobile integer has reached a spot where it's no more mobile, proceed with the next largest integer if it's mobile.

- iv. After each suppring, check if there's only number, larger than the current largest mobile. If there is one or more, change the lirection of all of them.
- V. The algorithm terminates when there are no more mobile.

Minteretter youlm alden.

det permute (xs, lauro):

if (ow +1 >= 1en (xs):

yield xs

else:

for p in parmite (xs, low+1)

yield p

for i in roope (law+1, len(xs)):

Challes, Cilx = Cilex, Enallex

for p in permute (xs, low+1);

yield p

RSCIDUS, ESCID = xSCiD, xSCIDUS)

- 3.) Outline aborithm for deleting a key from a binary search tree. Consider seperately three coses: (1) the key's node is a leaf; (2) the key's node has one child; (3) the key's node has two children.
  - a.) Would you classify this algorithm as a variable size decrease algorithm?
  - 5.) What is the time efficiency class of your aborithm?
- a) -> Binary Sourch Tree algoritmasindo elemon silmele isin:
  - . Silinecele elemonin hia accurage you ise direle null gopilir.
  - En al 1 aocuk vosa silme islemi direk geraeklesemez aünkü alt aspaa kaybedilmis olur.

Silinecek elemenin solundaki alt agacın en büyük elmainin ya da Sagindaki alt agacın en küaük elemainin silinen ekmain yerine yerlestirilməsi oprekir.

Bu algoritma variable-size-decrease degildir.

b) Binony Search tree W(n) & Oslogn) 'dir.

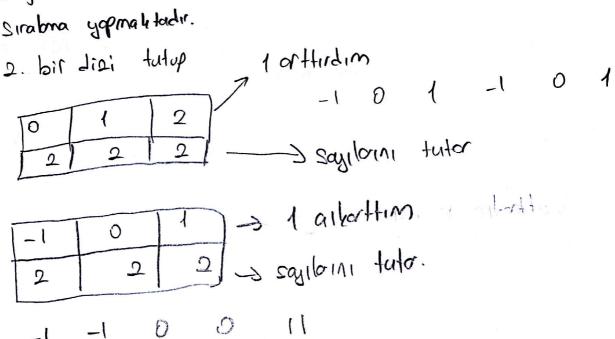
- 4.) Suppose that an array contains n numbers, earth of which is -1.0.1 Then the array can be sorted in O(n) time in the worst case. Prove or disprove that statement.
  - -> Counting sort algoritmos: -1,0,1 sayılarını O(n) 20mada

    Sırabr. |

    Teorik obak n sayıda sayıyı n 20mada sırabnak mimkin

    değildir. Ancak bu algoritma yerden fezagat ederek n 20mada

    Sırabna yapmaktadır.



5.) Given the array A[1...n) of sorted distinct integers, design a divide and conquer algorithm that finds and index i such that A[i]=i. Your absorithm should run in O(logn) time.

(logn) Dancedo calismos, iain binary search fullordim.

1/2/3/45/6) 7/8/9/10) AC2)=?

1123 45

2 13 sol tamba git

1101 2=2 balunda