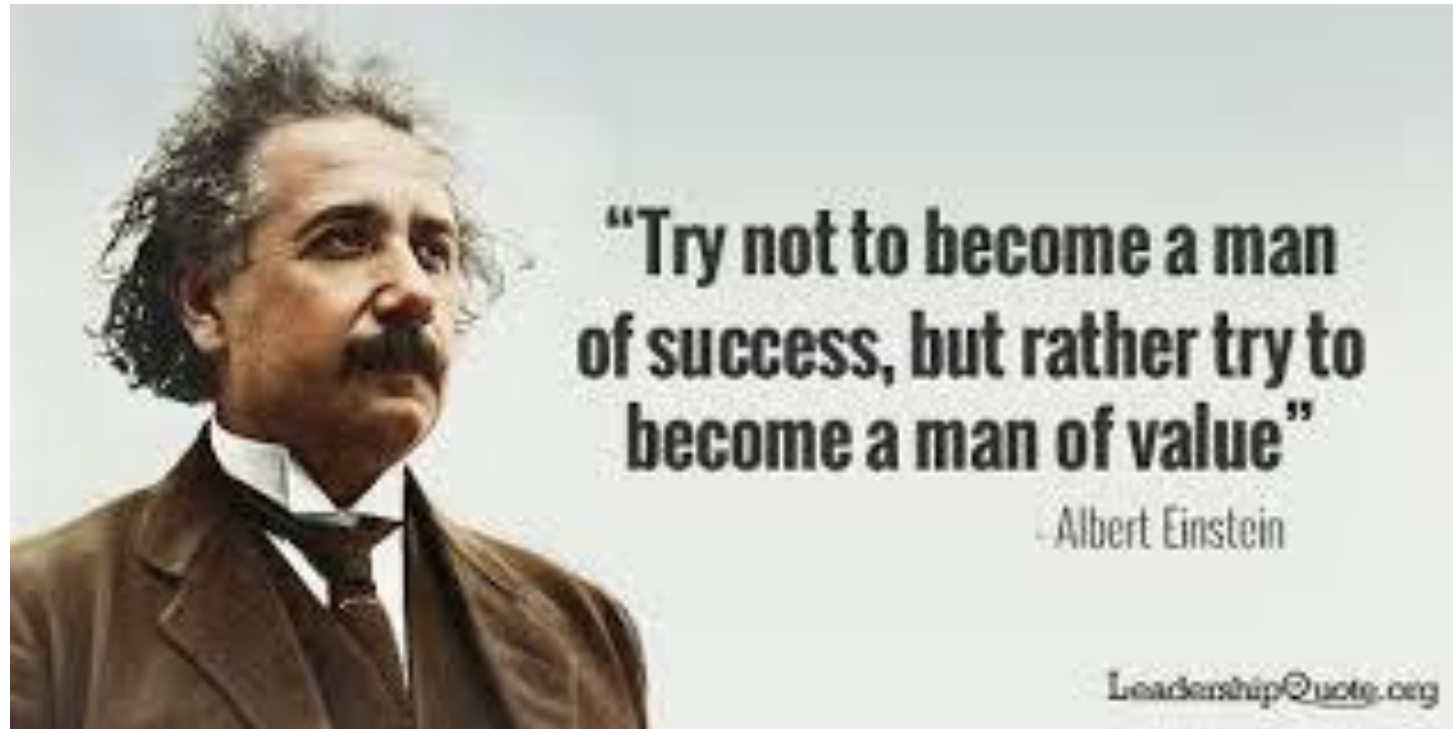


ARBORI BINARI DE CAUTARE



LUCRAREA DE CONTROL 12.05 ORA 16

Cautare recursiva in ABC

Tree - Search(x, k)

1 **if** $x = \text{NIL} \vee k = \text{key}[x]$

2 **return** x

3 **if** $k < \text{key}[x]$

4 **then** Tree - Search($\text{left}[x], k$)

5 **else** Tree - Search($\text{right}[x], k$)

Cautare iterativa in ABC

```
Iterative - Tree - Search(x, k)  
1 while  $x \neq \text{NIL} \wedge k \neq \text{key}[x]$   
2     do if  $k < \text{key}[x]$   
3         then  $x \leftarrow \text{left}[x]$   
4         else  $x \leftarrow \text{right}[x]$   
5 return  $x$ 
```

Elementul minim/maxim in ABC

Tree - Minimum(x)

```
1 while  $left[x] \neq NIL$   
2     do  $x \leftarrow left[x]$   
3 return  $x$ 
```

Tree - Maximum(x)

```
1 while  $right[x] \neq NIL$   
2     do  $x \leftarrow right[x]$   
3 return  $x$ 
```

Successorul unui nod in ABC

Tree - Successor(x)

1 **if** $right[x] \neq NIL$

2 **then return** Tree - Minimum($right[x]$)

3 $y \leftarrow p[x]$

4 **while** $y \neq NIL \wedge x = right[y]$

5 **do** $x \leftarrow y$

6 $y \leftarrow p[y]$

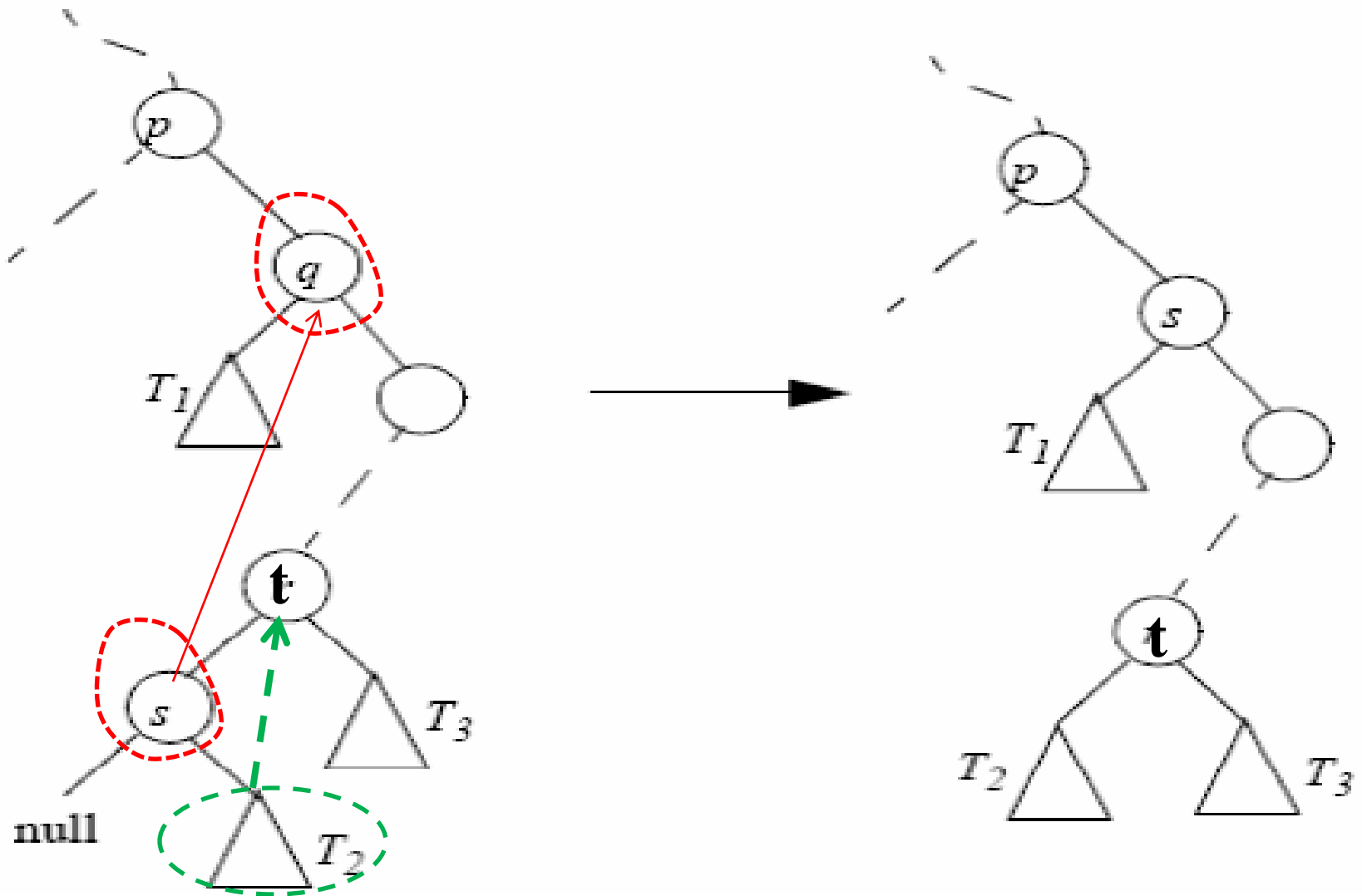
7 **return** y

Tree - Insert(T, z)

```
1  $y \leftarrow \text{NIL}$ 
2  $x \leftarrow \text{root}[T]$ 
3 while  $x \neq \text{NIL}$ 
4     do  $y \leftarrow x$ 
5     if  $\text{key}[z] < \text{key}[x]$ 
6         then  $x \leftarrow \text{left}[x]$ 
7         else  $x \leftarrow \text{right}[x]$ 
8  $p[z] \leftarrow y$ 
9 if  $y = \text{NIL}$ 
10 then  $\text{root}[T] \leftarrow z$ 
11 else if  $\text{key}[z] < \text{key}[y]$ 
12     then  $\text{left}[y] \leftarrow z$ 
13     else  $\text{right}[y] \leftarrow z$ 
```

Inserarea
unui nod
in ABC

Stergerea unui nod in ABC




```

Tree - Delete( $T, z$ )
1  if  $left[z] = NIL \vee right[z] = NIL$ 
2    then  $y \leftarrow z$ 
3    else  $y \leftarrow \text{Tree - Successor}(z)$ 
4  if  $left[y] \neq NIL$ 
5    then  $x \leftarrow left[y]$ 
6    else  $x \leftarrow right[y]$ 
7  if  $x \neq NIL$ 
8    then  $p[x] \leftarrow p[y]$ 
9  if  $p[y] = NIL$ 
10   then  $root[T] \leftarrow x$ 
11   else if  $y = left[p[y]]$ 
12         then  $left[p[y]] \leftarrow x$ 
13         else  $right[p[y]] \leftarrow x$ 
14  if  $y \neq z$ 
15  then  $key[z] \leftarrow key[y]$ 
16  Informatia din  $y$  se copiaza in  $z$ 

```

Stergerea unui nod in ABC