[Structuri de date]

* Seminar 1

$a \in O(b)$	$a \in \Omega(b)$	$a \in \Theta(b)$
$a \le b$	$a \ge b$	$a = b$

$f(n) \in \Theta(g(n)) \iff f(n) \in O(g(n))$ și $f(n) \in \Omega(g(n))$

"$\Rightarrow$"

$f(n) \in \Theta(g(n)) \Rightarrow \exists\, c_1, c_2 \in \mathbb{R}$

$[c_1 g(n) \le f(n)] \le [c_2 \cdot g(n)]$

$f(n) \in \Omega(g(n))$ $\quad$ $f(n) \in O(g(n))$

"$\Leftarrow$"

...

$f(n), g(n) \ge 0$

$\max(f(n), g(n)) \in \Theta(f(n) + g(n))$

Știm că dacă $f(n) \in \Theta(g(n)) \iff f(n) \in O(g(n))$ și $f(n) \in \Omega(g(n))$

$\max(f(n), g(n)) \in \Theta(f(n) + g(n)) \Rightarrow \max(f(n), g(n)) \in O(f(n) + g(n))$ ① și

$\max(f(n), g(n)) \in \Omega(f(n) + g(n))$ ②

① $\exists\, c \in \mathbb{R}$, $c > 0$, $n_0 \in \mathbb{N}$ a.î. $0 \le \max(f(n), g(n)) \le c \cdot (f(n) + g(n))$ (A)

$c(f(n) + g(n)) \ge \max(f(n), g(n))$

Ex. pt $c = 2$

② $\exists\, c \in \mathbb{R}$, $c > 0$, $n_0 \in \mathbb{N}$ a.î. $0 \le c(f(n) + g(n)) \le \max(f(n), g(n))$ (A)

Ex pt $c = \frac{1}{2}$

$\Rightarrow$ ① + ② $\max(f(n), g(n)) \in \Theta(f(n) + g(n))$

$o(g(n)) = \{ f(n) \mid \forall c \in \mathbb{R}_{c>0} \ \exists n_0 \in \mathbb{N}$ a.î. $0 \le f(n) < c\, g(n),\ \forall n \ge n_0 \}$

$n^2 \notin o(n^2)$ $\qquad \lim_{n \to \infty} \frac{f(n)}{g(n)} = 0$

$\omega(g(n)) = \{ f(n) \mid \forall c \in \mathbb{R}_{c>0} \ \exists n_0 \in \mathbb{N}$ a.î. $0 \le \cancel{f(n)}\ c \cdot g(n) < f(n),\ \forall n \ge n_0 \}$

$n \notin \omega(n)$ $\qquad \lim_{n \to \infty} \frac{f(n)}{g(n)} = \infty$

$T(n)$ este cel puțin $O(n^2)$

A. $o(g(n)) \cap \omega(g(n)) = \emptyset$

Pp că $f(n) \in A \Rightarrow \forall c_1 \in \mathbb{R}_{c_1>0} \ \exists n_1 \in \mathbb{N}$ a.î. $f(n) < c_1 g(n),\ \forall n \ge n_1$ $\Rightarrow$

$\Rightarrow \forall c_2 \in \mathbb{R}_{c_2>0} \ \exists n_2 \in \mathbb{N}$ a.î. $c_2 g(n) < f(n)\ \forall n \ge n_2$

$\Rightarrow \quad c_1 g(n) < f(n) < c_1 g(n) \quad \forall n \ge \max(n_1, n_2)$ $\times$

$(n+a)^b \in \Theta(n^b) \quad \forall a \in \mathbb{R}_+,\ \forall b \in \mathbb{N}^*$

$\cancel{(n+a)^b \ge n^b}$

$(n+a)^b = \cancel{n^b + n} \ C_b^0 n^b a^0 + C_b \ldots$

$V = \{V_1, V_2, \ldots, V_n\}$ $V_i \in \mathbb{Z}$

$n = |V| \le 10^5$ $\qquad$ Ex: 2 7 1 3 4 25 $\qquad$ (3,5) DA

$m = |A| \le 10^5$

(i, j)