

List of Notations

Notation	Description	Page
Assumptions	General assumptions	44, 64
p and q	Logical “and” of formulas p and q	65
A^n	Cartesian product of n copies of A	65
$A \times B$	Cartesian product of sets A and B	65
$\lceil r \rceil$	Ceiling of the real number r	64
χ_A	Characteristic function of a set A	67
\bar{A}	Complement of the set A	70
$S \circ R$	Composition of relations S and R	66
$c_1 \xrightarrow{t} c_2$	Computation starting at c_1 reaching c_2 after t steps	24
$c_1 \xRightarrow{*} c_2$	$\exists t \in \mathbb{N}, c_1 \xrightarrow{t} c_2$	24
$c_1 \rightarrow c_2$	Transition from c_1 to c_2 in one step	24
KL	Concatenation of K with L	80
L^+	$L^* - \{\epsilon\}$	80
L^*	Set of finite words generated by L	80
Σ^*	Free monoid of words generated by Σ	78
Σ^+	$\Sigma^* - \{\epsilon\}$	79
Σ^n	Set of words of length n	78
\simeq_L^r	Right congruence relation corresponding to $\mathcal{M}_r(L)$	42
\simeq_L^l	Left congruence relation corresponding to $\mathcal{M}_l(L)$	45
$\mathbf{1}_A$	Constant map on A equal to one or A^2	37, 67
$\mathbf{0}_A$	Constant map on A equal to zero	67
$\stackrel{\text{def}}{=}$	is defined to be	64
$d_G^-(v)$	In-degree of the vertex v in G	87
$d_G^+(v)$	Out-degree of the vertex v in G	87
$A - B$	Difference of sets A and B	70
$A \Delta B$	Symmetric difference of sets A and B	71
$d_r(w)$	Minimum distance of elements of $\Upsilon \subseteq \Gamma^*$ in $w \in \Gamma^*$	79
$\text{dom}(R)$	Domain of the relation R	66
\emptyset	The empty set	65
$A = B$	A is equal to B (as sets)	65
$[a]_R$	Equivalence class of the element a w.r.t. R	71
$p \Leftrightarrow q$	Logical “equivalence” (p if and only if q)	65
$A \sim B$	Cardinal equivalence of sets A and B	68
\sim_L	Equivalence relation determined by $L \in \Sigma^*$	41
\sim_σ	Equivalence relation of an onto map σ	36, 71
$\exists x \in A, p(x)$	Existential quantifier	65

Notation	Description	Page
$\exists! x \in A, p(x)$	“There exists a unique” quantifier	65
$\lfloor r \rfloor$	Floor of the real number r	64
$f(a)$	Image of the point a under function f	66
$f(A)$	Image of the set A under function f	67
B^A	Set of total functions (maps) from A to B	67
$\mathcal{F}(A, B)$	Set of partial functions from A to B	67
$g _A$	Restriction of function g to the set A	67
$G = (V, E, +, -, \ell)$	A labeled multigraph	87
Id_A	Identity map on A	67
$im(R)$	Image of the relation R	66
$p \Rightarrow q$	Logical “implication” p implies q	65
\mathbb{Z}	Set of integers	64, 68
$\inf_{i \in I} x_i$	Infimum of $\{x_i : i \in I\}$	74
$\inf B$	Infimum of B in a given poset	74
$\text{Infix}(w)$	Infix set of a word w	79
$A \cap B$	Intersection of sets A and B	69
$\bigcap_{i=1}^n A_i$	Intersection of the family of sets $\{A_1, \dots, A_n\}$	69
$\bigcap_{i \in I} A_i$	Intersection of the family of sets $\{A_i : i \in I\}$	69
$\bigcap_{i=1}^{\infty} A_i$	Intersection of the family of sets $\{A_i : i \in \mathbb{N}\}$	69
$\bigcap_{i=1} B$	Intersection of the family of sets $\{B : i \in X\}$	69
$w[i, k]$	Infix of w centered at w_i of radius k	20, 79
$f^{-1}(B)$	Inverse image of the set B under function f	67
f^{-1}	Inverse of function f	68
R^{-1}	Inverse of the relation R	66
$\bigwedge_{i \in I} x_i$	Infimum of the set $\{x_i : i \in I\}$	74
$\mathcal{A} \cong \mathcal{B}$	Isomorphism of structures \mathcal{A} and \mathcal{B}	35
\mathcal{U}_{Σ}^l	Left universal preautomaton for Σ	38
$ w $	Length of a word $w \in \Sigma^*$	79
$ w _{\Upsilon}$	Length of a word $w \in \Sigma^*$ w.r.t. $\Upsilon \subseteq \Sigma$	79
$ w _a$	Length of a word $w \in \Sigma^*$ w.r.t. $\{a\} \subseteq \Sigma$	79
\ll	Lexicographic order on Σ^*	79
$\llbracket m, n \rrbracket$	$\{m, m+1, \dots, n\}$	65
$\llbracket n \rrbracket$	$\{1, \dots, n\}$	65
$N_G(v)$	Neighbourhood of the vertex v in G	87
$N_G^-(v)$	In-neighbourhood of the vertex v in G	87
$N_G^+(v)$	Out-neighbourhood of the vertex v in G	87
\mathbb{N}	Set of natural numbers including zero	64
ϵ	Null word	79
$f : A \longleftrightarrow B$	One to one correspondence f between A and B	67
$f : A \xrightarrow{1-1} B$	A one to one function f from A to B	67
$f : A \twoheadrightarrow B$	An onto function f from A to B	67
$\mathcal{B}_l(w)$	Operation of \mathcal{B} on w from the right	39
$\mathcal{B}_r(w)$	Operation of \mathcal{B} on w from the left	39

Notation	Description	Page
$p \text{ or } q$	Logical “or” of formulas p and q	65
$\Pi_k(A)$	Set of k -partitions of A	71
$\Pi(A)$	Set of partitions of A	71
$a \wedge b$	Infimum of the set $\{a, b\}$	74
$s(a)$	Initial segment of a in a DCC poset	76
A^n	Cartesian power of a set A	71
$A^{(n)}$	$\bigcup_{1 \leq m \leq n} A^m$	71
$\mathcal{P}(A)$	Power set of a set A	65
\preceq	Prefix order on Σ^*	79
$<$	Strict prefix order	79
Prefix(w)	Prefix set of a word w	79
\leq	Preorder relation	72
$P(C, G, R)$	A problem-type	12
$\mathcal{D}_k(A)$	Set of k -subpartitions of A	71
$\mathcal{D}(A)$	Set of subpartitions of A	71
$K \setminus L$	Left quotient of L by K	80
$x \setminus L$	Left quotient of L by $\{x\}$	80
A/R	Quotient of A by the relation R	71
L/K	Right quotient of L by K	80
L/x	Right quotient of L by $\{x\}$	80
$\text{ran}(R)$	Range of the relation R	66
L^R	Reverse of a language L	80
w^R	Reverse of the word w	79
\mathcal{U}_Σ^r	Right universal preautomaton for Σ	38
\mathbb{Q}	Set of rational numbers	64, 68
\mathbb{R}	Set of real numbers	64
$(r)^-$	Negative part of the real number r	64
$(r)^+$	Positive part of the real number r	64
$\{A_i\}_{i \in I}$	An indexed family of sets	68
$a \in A$	a is a member of the set A	64
$a \notin A$	a is not a member of the set A	64
$A \subseteq B$	A is a subset of B	65
$A \subset B$	A is a subset of B and $A \neq B$	65
$A \supseteq B$	A is a superset of B	65
$A \supset B$	A is a superset of B and $A \neq B$	65
$ A $	Size of a finite set A	64
$a \vee b$	Supremum of the set $\{a, b\}$	74
$\bigvee_{i \in I} x_i$	Supremum of the set $\{x_i : i \in I\}$	74
Suffix(w)	Suffix set of a word w	79
$\sup_{i \in I} x_i$	Supremum of the set $\{x_i : i \in I\}$	74
$\sup B$	Supremum of B in a given poset	74
:	Such that	64
$f : A \bullet \rightarrow B$	A total function f from A to B	66
$\forall x \in A, p(x)$	Universal quantifier	65
$A \cup B$	Union of sets A and B	68
$\bigcup_{i=1}^n A_i$	Union of the family of sets $\{A_1, \dots, A_n\}$	69

Notation	Description	Page
$\bigcup_{i \in I} A_i$	Union of the family of sets $\{A_i : i \in I\}$	69
$\bigcup_{i=1}^{\infty} A_i$	Union of the family of sets $\{A_i : i \in \mathbb{N}\}$	69
$\bigcup_{B \in X} B$	Union of the family of sets $\{B : i \in X\}$	69

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