DSA TAG CLUB CHEAT SHEET

Sorting-

Algorithm	In place	Stable	Best Case	Average Case	Worst Case
Selection	Yes	No	(n^2)/2	(n^2)/2	(n^2)/2
Insertion	Yes	Yes	n	(n^2)/4	(n^2)/2
Bubble	Yes	Yes	n	(n^2)/2	(n^2)/2
Shellsort	Yes	No	n $\log_3$ n	----------	----------
Mergesort	No	Yes	(nlgn)/2	n lgn	n lgn
Quicksort	Yes	No	n lgn	2n ln(n)	(n^2)/2
Heapsort	Yes	No	n logn	2n lgn	2n lgn

Priority Queues-

DATA STRUCTURE	INSERT	DEL-MIN	MIN	DEC-KEY	DELETE	MERGE
array	1	*n*	*n*	1	1	*n*
binary heap	log *n*	log *n*	1	log *n*	log *n*	*n*
***d*-way heap**	$\log_d n$	$d \log_d n$	1	$\log_d n$	$d \log_d n$	*n*
binomial heap	1	log *n*	1	log *n*	log *n*	log *n*
Fibonacci heap	1	log *n* †	1	1 †	log *n* †	1

† amortized guarantee

Symbol Tables-

	worst case			average case		
DATA STRUCTURE	**SEARCH**	**INSERT**	**DELETE**	**SEARCH**	**INSERT**	**DELETE**
sequential search (in an unordered list)	*n*	*n*	*n*	*n*	*n*	*n*
binary search (in a sorted array)	log *n*	*n*	*n*	log *n*	*n*	*n*
binary search tree (unbalanced)	*n*	*n*	*n*	log *n*	log *n*	sqrt(*n*)
red-black BST (left-leaning)	log *n*	log *n*	log *n*	log *n*	log *n*	log *n*
AVL	log *n*	log *n*	log *n*	log *n*	log *n*	log *n*
hash table (separate-chaining)	*n*	*n*	*n*	1 †	1 †	1 †
hash table (linear-probing)	*n*	*n*	*n*	1 †	1 †	1 †

† uniform hashing assumption

Graph Processing-

PROBLEM	ALGORITHM	TIME	SPACE
path	DFS	$E + V$	V
shortest path (fewest edges)	BFS	$E + V$	V
cycle	DFS	$E + V$	V
directed path	DFS	$E + V$	V
shortest directed path (fewest edges)	BFS	$E + V$	V
directed cycle	DFS	$E + V$	V
topological sort	DFS	$E + V$	V
bipartiteness / odd cycle	DFS	$E + V$	V
connected components	DFS	$E + V$	V
strong components	Kosaraju–Sharir	$E + V$	V
strong components	Tarjan	$E + V$	V
strong components	Gabow	$E + V$	V
Eulerian cycle	DFS	$E + V$	$E + V$
directed Eulerian cycle	DFS	$E + V$	V
transitive closure	DFS	$V\,(E + V)$	V^2
minimum spanning tree	Kruskal	$E \log E$	$E + V$

minimum spanning tree	Prim	$E \log V$	V
minimum spanning tree	Boruvka	$E \log V$	V
shortest paths (nonnegative weights)	Dijkstra	$E \log V$	V
shortest paths (no negative cycles)	Bellman–Ford	$V (V + E)$	V
shortest paths (no cycles)	topological sort	$V + E$	V
all-pairs shortest paths	Floyd–Warshall	V^3	V^2
maxflow–mincut	Ford–Fulkerson	$E V (E + V)$	V
bipartite matching	Hopcroft–Karp	$V^{1/2} (E + V)$	V
assignment problem	successive shortest paths	$n^3 \log n$	n^2

References- https://algs4.cs.princeton.edu/cheatsheet/