3805ICT Study Guide - 2022

Topic	Explain Theory	Explain Lecture / Weekly Problems	Solve New Problems
Dynamic Programming	✓	✓	✓
Matrix-chain multiplication, Longest common subsequence, Optimal binary search tree, Weighted interval scheduling, Segmented least squares			
Graph Theory			
Introduction – Bipartite Graphs, Isomorphism, Euler definitions	✓	✓	N/A
Connectivity	✓	✓	✓
Paths	✓	✓	✓
Planar Graphs	✓	✓	✓
Graph Problems	✓	✓	✓
Graph Algorithms			
Maximum Flow	✓	✓	N/A
Ford-Fulkerson	✓	✓	✓
Edmonds-Karp	✓	✓	✓
Dijkstra's Algorithm	✓	✓	✓
Bellman-Ford Algorithm	✓	✓	✓
Shortest Paths in DAGs	✓	✓	✓
Floyd-Warshall Algorithm	✓	✓	✓
Data Structures			
Amortised Analysis	✓	✓	✓
Skip-Lists	✓	✓	✓
Disjoint-Sets – Union, Path Compression	✓	✓	✓
Fibonacci Heaps – Insert, Union, Delete Min, Decrease Key	✓	✓	✓
Treaps – Insert, Delete	✓	✓	✓
Huffman Trees and Codes	✓	✓	✓
Red-Black Trees – Properties, 2lg(n+1), Insert, Delete	✓	✓	✓
Splay Trees – Top Down, Bottom Up, Find, Delete, Insert, Split, Join	✓	✓	✓
Tries and Compressed Tries – Build, Find, Insert, Delete	✓	✓	✓
Suffix Trees and Arrays – Build	✓	✓	✓
van Emde Boas Trees – Storing a set of numbers	✓	✓	✓
X-Fast and Y-Fast tries – Store integer numbers	✓	✓	✓
Multi-Dimensional Search Trees Range Trees, kD, Quad Trees (Build, Find, Insert, Delete)	✓	✓	✓
Augmented Data Structures – OS, Interval	✓	✓	✓
Approximation Algorithms			
NP-Complete	✓	N/A	N/A
Theory	✓	N/A	N/A
Vertex Cover - Proof	✓	✓	✓
Travelling Salesman - Proof	✓	✓	✓
Set Cover	✓	✓	✓
Bin Packing	✓	✓	✓
Knapsack Problem	✓	✓	✓
Geometric Algorithms			
Primitive Operations	✓	✓	✓
Convex Hull	✓	✓	✓
Closest Point	✓	✓	✓
Randomised Algorithms			
Introduction	✓	✓	✓
Examples	✓	✓	✓
Randomised Algorithm Classes	✓	✓	✓