

Government Engineering College, Modasa

Computer Engineering / Information Technology Department

Semester - V

Design and Analysis of Algorithms

Tutorials

Tutorial -1

1. What is an algorithm? Explain various properties of any algorithm.
2. What do you mean by analysis of algorithm?
3. Explain various type of algorithm with example
4. Define: -subset, empty set, null string, power set, equal set.
5. If $A = \{1,2,3,4,5\}$, $B = \{1,3,5,7,9\}$ & Universal set $U = \{1,2,3,4,5,6,7,8,9,10\}$
(i) $A \cup B$ (ii) $A \cap B$ (iii) $A - B$ (iv) $A \setminus B$ (v) $A * B$
6. Arrange following rate of growth in increasing order: 2^N , $n \log n$, n^2 , 1 , n , $\log n$, $n!$, n^3
7. Define: - Time complexity, space complexity
worst case, best case, Average Case
8. What are asymptotic notations?
9. Define: -Big oh, Big omega, theta

Tutorial -2

1. Analyze following sorting methods in best & worst case
(i) Selection sort (ii) Bubble sort (iii) Insertion sort (iv) Quick sort (v) Heap Sort
2. Illustrate the operation of bubble sort, selection sort and insertion sort on following array
(1) $\langle 31,41,59,26,41,48,101,99,78 \rangle$ (2) $\langle 1,3,5,8,9,10 \rangle$ (3) $\langle 10,2,13,15,19,2,18 \rangle$
3. Analyze sequential (linear) search & binary search in best & worst case.
4. Compare Iterative and recursive algorithm to find out Fibonacci series.
5. What do you mean by amortized analysis?

6. Create MinHeap and MaxHeap for the following list
 (1) <G,F,D,C,B,A,H,I,J,K> (2) <5,15,8,3,9,65>
7. Sort following array using Heap Sort
 (1) <5,8,3,9,2,10,1,45,32> (2) <2,5,16,4,10,23,39,18,25,15>
8. Sort following array using Quick sort
 (1) <2,3,18,17,5,1> (2) <5,5,8,9,3,4,4,3,2>

Tutorial - 3

1. Define: feasible solution, optimal solution.
2. Explain characteristics of greedy method with suitable example.
3. Define: spanning tree, minimum spanning tree (MST), connected graph, fully connected graph, dense graph, sparse graph.
4. Explain prim's algorithm & kruskal's algorithm. Also write comparison of both.
5. Given undirected graph as follow.

V1, V2 = 5, V2, V3=3 V3,V4 =2 V5, V6=6 V6, V4=2 V7, V8=5
 V1, V7 =6 V2, V5=2 V5, V7,3 V8, V8=4
 V1, V5 =4 V2, V6=4

Find MST using prim's & kruskal's algorithm.

Tutorial -4

1. Solve given binary knapsack problem using greedy method to get optimal rofit (value).

(1) N=3, P=6. W(i) = (2,3,3) v(i)=(1,2,4)

(2) N=5, p=20, w(i) = (9,3,5,7,2) v(i)=(15,14,6,20,10)

2. Solve given fractional knapsack problem to get optimal profit.

N=5, p=35, w(i) = (10,14,12,7,15), v(i) = (20,35,25,40,30)

3. Find optimal order of following jobs such that average waiting (response) time is minimized.

Jobs	1	2	3	4	5	6	7
Execution time	20	15	7	22	17	19	6

4. Compare greedy method with dynamic programming.
5. Explain the term : principal of optimality.

Tutorial - 5

1. Given coins of denominations 1,2,5,7 with amount to be pay is 12. Find optimal no. of coins & sequence of coins used to pay given amount.
2. A directed & weighted graph is given as below. Find all pair shortest paths using Floyd algorithm.

$$(1,2)=1, \quad (2,4)=2, \quad (2,5)=4$$

$$(3,2)=9, \quad (3,4)=5, \quad (3,5)=3$$

$$(5,1)=2$$

3. Following five matrix are given with corresponding dimensions. Find the order of their multiplication such that total no. of multiplications requires are minimized.

$$A=4*10, \quad B=10*3 \quad C=3*12$$

$$D=12*20 \quad E=20*7 \quad \text{Ans : 1334}$$

4. Find at least two longest common sub sequences of given two strings using DP.

$$S1=A, B, C, D, B, A, C, D, F$$

$$S2=C, B, A, F$$

Tutorial - 6

1. Define: backtracking.
2. Solve 4-queen problem using backtracking. Find all possible solutions.
3. Explain rabin- carp method for string matching and also give the algorithm.
4. Explain finite automata for string matching.
5. For string matching working module $q=11$, how many spurious hits does the Rabin krap matcher encounter in the text $T=3141592653589793$, when looking for the pattern $P=26$?
6. Show the comparisons the naïve string matcher makes for the pattern $P=10001$ in the text $T=0000100010010$.