

Design & Analysis of Algorithms
CS402

TIME ALLOTTED: 3 HOURS

FULL MARKS: 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable

GROUP – A

(Multiple Choice Type Questions)

1. Answer any *ten* from the following, choosing the correct alternative of each question: **10×1=10**

SL	Question	Marks	Co	Blooms Taxonomy Level
(i)	Which of the following are characteristics of an algorithm? A. Algorithm should be clear B. Algorithm should be unambiguous C. Algorithms must terminate after a finite number of steps D. All of the above	1	1	1
(ii)	An algorithm should have _____ well-defined inputs. A. 0 B. 1 C. 0 or more D. 1 or more	1	1	1
(iii)	An ____ is defined as a set of well-defined instructions used to accomplish a particular task. a. Algorithm b. Function c. Program d. Procedure	1	1	1
(iv)	____ of an algorithm is the amount of time required for it to execute. a. Time complexity b. Space complexity c. Compiling time d. Best case	1	1	2
(v)	____ is not a balanced search tree. a. AVL tree b. Binary tree c. Red-black tree d. B-tree	1	1	2
(vi)	The two main conditions for theta notation are ____ and ____. a. $f(n)=O(g(n))$, $f(n)\neq\Theta(g(n))$	1	2	2,3,4

- b. $f(n) > O(g(n))$, $f(n) = \Theta(g(n))$
c. $f(n) \neq O(g(n))$, $f(n) \geq \Theta(g(n))$
d. $f(n) > O(g(n))$, $f(n) > \Theta(g(n))$
- (vii) Which algorithm finds the solution for the single-source shortest path problem for a tree?
a. Prim's
b. Dijkstra's
c. Kruskal's
d. Huffman code
- (viii) The basic operation of the ____ algorithm is the comparison between the element and the array given.
a. Binary search
b. Greedy
c. Brute force
d. Insertion sort
- (ix) Which of the following is a dynamic programming problem?
a) Longest Common Subsequence
b) Binary Search
c) Depth First Search
d) Breadth First Search
Answer: a) Longest Common Subsequence
- (x) Which of the following algorithms is used to find the maximum flow in a network with capacities that can change over time?
a) Dijkstra's algorithm
b) Bellman-Ford algorithm
c) Edmonds-Karp algorithm
d) Ford-Fulkerson algorithm
- (xi) Which of the following algorithms is used to find the shortest path between all pairs of vertices in a graph with positive and negative edges?
a) Dijkstra's algorithm
b) Bellman-Ford algorithm
c) Floyd-Warshall algorithm
d) Kruskal's algorithm
- (xii) Which of the following data structures is best suited for implementing a hash table?
a) Array
b) Linked list
c) Stack
d) Queue

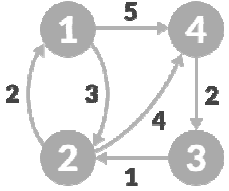
GROUP – B

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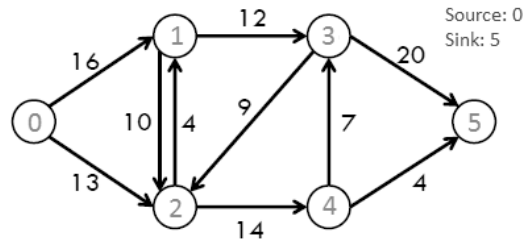
(Short Answer Type Questions)
(Answer any three of the following) $3 \times 5 = 15$

SL	Question	Marks	Co	Blooms Taxonomy Level
2.	What is Algorithm. Explain 5 characteristics of an algorithm.	5	1	1
3.	Write a recursive algorithm for calculating the factorial of a number.	5	1	1
4.	Find optimal solution to the knapsack problem instance $n=6$, $m=15$, $(p_1 \dots p_6) = (10, 5, 15, 7, 6, 18)$, $(w_1 \dots w_6) = (2, 3, 5, 7, 1, 4)$	5	2	2
5.	Differentiate between DFS and BFS with example.	5	3	1
6.	Write an algorithm for Naïve Algorithm.	5	4	1

GROUP – C
(Long Answer Type Questions)
(Answer any three of the following) $3 \times 15 = 45$

SL	Question	Marks	Co	Blooms Taxonomy Level
7.	(i) State Master Theorem. Solve the recurrence relation using Master Theorem: $T = 2(T/2) + n^2 + 2n + 55$	2+5	1	1
	(ii) Write the algorithm for general iterative backtracking method and explain various factors that define the efficiency of backtracking.	8	3	1
8.	(i) Consider the following example and solve through Dijkstra Algorithm.	7	4	2
				
	(ii) Differentiate between 0/1 and Fractional Knapsack problem with example.	4+4	4	2
9.	(i) Write pseudo code for Naïve algorithm.	5	4	1
	(ii) Explain Knight tour on chess board with an example. Measure the time complexity.	10	4	1

10. Solve Maxflow Mincut theorem with the following examples: 15 5 3



11. Write a short note on: Dynamic Programming, Relation between P, NP, and NP Hard Class, Backtracking. 5x3 5 2