GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2020-2021
DESIGN AND ANALYSIS OF ALGORITHMS (Backlog)
IT501

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)

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

			Marks	CO No
1.	(i)	Single source shortest path in a graph having negative edge can be solved by— a) Bellman-Ford algorithm b) Dijkstra's algorithm c) Floyd Warshall algorithm d) both (a) and (b)	1	CO2
	(ii)	Minimum number of colours to colour a graph having n > 3 vertex is— a) 3 b) 4 c) 1 d) 2	1	CO3
	(iii)	Which of the following is not a characteristic of good algorithm? a) Precise b) finite number of steps c) Ambiguous d) logical flow of control	1	CO2
	(iv)	We use dynamic programming approach when a) we need an optimal solution b) the solution has optimal substructure c) It's faster than Greedy d) The given problem can be reduced to 3-SAT problem	1	CO 2
	(v)	What is a hash table? a) A structure that maps values to keys b) A structure that maps keys to values c) A structure used for storage d) A structure used to implement stack and queue	1	CO.1
	(vi)	Which one of the following is true? a) All NP hard problems are NP complete b) All NP complete are NP hard c) Some NP complete problems are NP hard d) None of these	1	CO.1

(vii)	The complexity of Binary Search algorithm on n items is a) O (n) b) O (log n) c) c) O (n^2) d) O (n log n).	1	CO.2
(viii)	Job sequencing with dead line based on _____method a) greedy method b) branch and bound c) dynamic programming d) divide and conquer	1	CO1
(ix)	If several elements are competing for the same bucket in the hash table, what is it called? a) Diffusion b) Replication c) Collision d) None of the mentioned	1	CO.1
(x)	The running time of Heap sort is. a) O(n logn) b) O(n) c) c)O(n^2) d) both b and c	1	CO1
(xi)	Vertex cover problem belongs to? a) Approximation Approach b) Greedy approach c) Backtracking Method d) Dynamic Approach	1	CO3
(xii)	Which among the following is the best when the list is already sorted— a) Selection sort b) Merge sort c) Bubble sort d) Insertion sort	1	CO2

GROUP – B
(Short Answer Type Questions)

Answer any ***three*** from the following: **3×5=15**

			Marks	**CO No**
2.	(a)	Draw the recursive tree and find the time complexity for the following recurrence relation $3T(n/4) + cn^2$	3	CO3
	(b)	Draw the recursive tree and find the time complexity for the following recurrence relation: $2T(n/2) + cn$	2	CO3
3.	(a)	Prove that the lower bound for comparison sort is O(n lg n)	5	C02
4.	(a)	Define Clique Decision problem.	1	CO2
	(b)	Prove CDP is NP complete problem.	4	CO2

5.	(a)	Define different asymptotic notation (O, Ω,Θ) with suitable examples.	5	CO1
6.	(a)	Write a backtracking algorithm for solving 8-queen problem.	5	CO2

GROUP – C*
(Long Answer Type Questions)

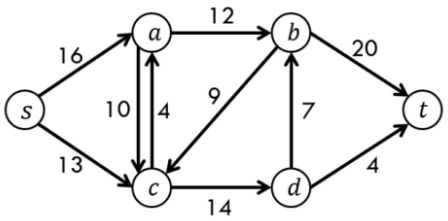
Answer any ***three*** from the following: **3×15=45**

			Marks	CO No.
7.	(a)	Find optimal parenthesizations for multiplying the following matrices: $[A1]_{10\times5}$, $[A2]_{5\times10}$, $[A3]_{10\times50}$, $[A4]_{50\times5}$, $[A5]_{5\times10}$	9	CO4
	(b)	Explain Union-Find Algorithm with proper example	6	CO2
8.	(a)	Consider the following:	8	CO4

Object	I1	I2	I3	I4	I5
Weight	10	20	30	40	50
Profit	20	30	66	40	60

If a person have a knapsack (capacity 100), then find out the maximum profit that the person can earn using fractional knapsack problem. (Show the necessary steps taken)

	(b)	Explain one solution for solving all pair shortest path problem in a directed graph using dynamic programming formulation. Explain the technique with algorithm and example.	7	CO4
9.	(a)	Explain one technique for solving multiplication of two matrices having complexity $O(n^{2.81})$	7	CO3
	(b)	Explain one solution for solving all pair shortest path problem in a directed graph using dynamic programming formulation. Explain the technique with algorithm and example.	8	CO4
10.	(a)	Find the minimum number of operations required for the following matrix chain multiplication using dynamic programming: $[A]_{10\times20}$, $[B]_{20\times1}$, $[C]_{1\times10}$, $[D]_{10\times20}$, $[E]_{20\times100}$	9	C04
	(b)	Apply Ford-Fulkerson algorithm to find the Maximum flow between source(s) and the sink(t) in the given network.	6	CO1



11.		Short Notes(Answer any three of the following):	3x5	
	(a)	Prim's Algorithm	5	CO2
	(b)	KMP String Matching Algorithm	5	CO3
	(c)	Solution of Single source shortest path proble	5	CO4
	(d)	Ford- Fulkerson Algorithm	5	CO2
	(e)	Heap sort	5	CO1