BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(QUIZ-I SP2023)

CLASS: BCA
BRANCH:BCA

SEMESTER: IV
SESSION: SP/2023

SUBJECT: CA255 FUNDAMENTALS OF CPMPUTER ALGORITHM

TIME: 01 Class Hour

FULL MARKS: 10

INSTRUCTIONS:
1. The question paper contains 2 questions each of 5 marks and total 10 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.

			CO	BL
Q.1(a)	What is algorithm? List main criteria of algorithm.	[2]		

Q.1(b)	Find time complexity of the following matrix addition algorithm using tabular method:
	Algorithm ADD (A, B, C, m,n)
	{
	for i=1 to m do
	{
	for j=1 to n do
	{
	C[I,j]= A[I,j] + B[I, j];
	}
	}
	}
	}
		[3]		

Q.2(a)	Show that $3n^2 + 5 = \theta(n^3)$	[2]		
Q.2(b)	Analyze the relations between Big-Oh (O), Bog-Omega (Ω), and Big-Theta (θ)	[3]		

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BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(QUIZ-II SP2023)

CLASS: BCA
BRANCH:BCA

SEMESTER: IV
SESSION: SP/2023

SUBJECT: CA255 FUNDAMENTALS OF CPMPUTER ALGORITHM

TIME: 01 Class Hour

FULL MARKS: 10

INSTRUCTIONS:
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2. Attempt all questions.
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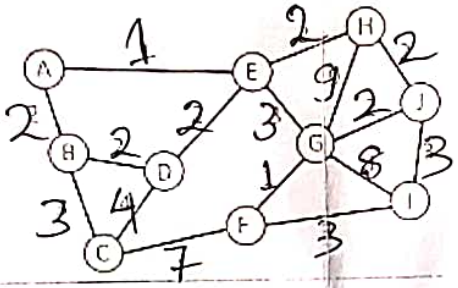
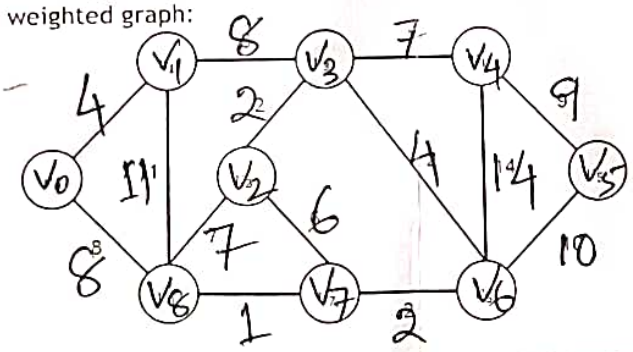
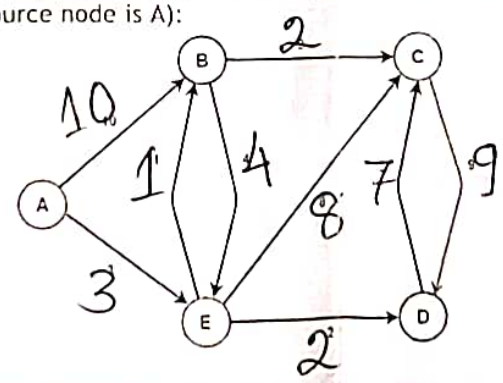
			CO	BL
Q.1(a)	Solve the fractional knapsack problem of n=5 items with Knapsack Capacity (W)=6: weight(wi): =<3,2,1,4,5> and value(vi): = <25,20,15,40,50>	[2]		
Q.1(b)	Use Prim's algorithm to find Minimum Spanning Tree (MST) of the following weighted graph: 	[3]		
Q.2(a)	Use Kruskal's algorithm to find Minimum Spanning Tree (MST) of the following weighted graph: 	[2.5]		
Q.2(b)	Use Dijkstar's algorithm to find shortest path of the following weighted digraph (with source node is A): 	[2.5]		

:::::10/04/2023:::::

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP2023)

CLASS: BCA
BRANCH: BCA

SEMESTER : IV
SESSION : SP2023

SUBJECT: CA255 FUNDAMENTALS OF COMPUTER ALGORITHMS

TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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			CO	BL
Q.1(a)	Define the asymptotic notation Ω.	[2]	B	L-1
Q.1(b)	Solve the following recurrence relation to find an upper bound of T(n): $T(n) = 4T(n/2) + 1,\ T(1) = 1$	[3]	B	L-2,3
Q.2(a)	Estimate the time complexity of the following algorithm to compute *sum*, where *p* and *q* are any two integers. Step 1: *sum* = 0 Step 2: for i = 1 to *p* execute the following Step 2.1: for j = 1 to *q* execute the following Step 2.1.1: *sum* = *sum* + 1 Step 3: Output *sum*	[2]	B	L-3
Q.2(b)	With the help of a suitable example, explain the best and the worst case time complexities of an algorithm.	[3]	B	L-2
Q.3(a)	Explain divide and conquer design paradigm.	[2]	A	L-2
Q.3(b)	Explain binary search algorithm.	[3]	A	L-2
Q.4(a)	Given two sorted lists of numbers of size m and n. What is the time required to merge these two lists to form a single sorted list?	[2]	D	L-3
Q.4(b)	Mention and justify the best and the worst case time complexities of quick sort algorithm.	[3]	B	L-3
Q.5(a)	Explain the important features of Greedy design paradigm.	[2]	A	L-2
Q.5(b)	Solve the following instance of general Knapsack problem using a greedy method and hence find the maximum profit. Capacity of the Knapsack: 17 Weight vector: < 2, 3, 2, 8, 6, 4, 4, 2 > Profit Vector: < 7, 2, 4, 18, 12, 16, 6, 20 >	[3]	A	L-3

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BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BCA
BRANCH: BCA

SEMESTER: IV
SESSION: SP/2023

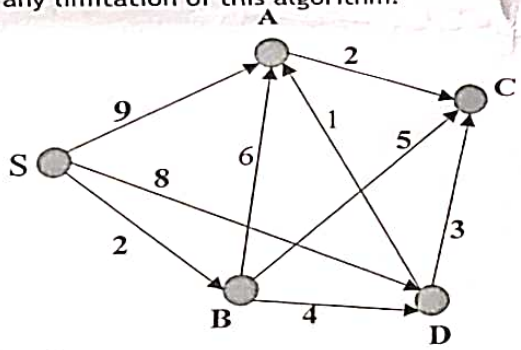
SUBJECT: CA255 FUNDAMENTALS OF COMPUTER ALGORITHMS

TIME: 3 Hours

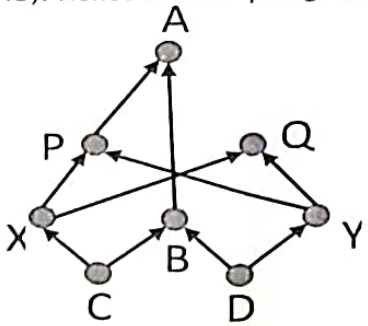
FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	Define the asymptotic notation Ω. Prove or disprove: $n^2 + 4n \log n = O(n^2)$	[2+3]	CO1	L-1,5
Q.1(b)	Illustrate all the steps of insertion sort algorithm to sort the sequence of numbers <40, 11, 56, 23, 35, 16> in ascending order. Hence count the total number of comparisons carried out among these numbers.	[4+1]	CO1	L-2,3
Q.2(a)	Explain quick-sort algorithm with the help of a suitable example. What is the best-case and worst-case time complexities of quick-sort algorithm?	[3+2]	CO3	L-2,1
Q.2(b)	Derive the time complexity of merge-sort algorithm. Comment on its space complexity.	[3+2]	CO4	L-4,2
Q.3(a)	Apply Dijkstra's algorithm on the following graph to compute shortest paths from the vertex 'S' to all other vertices in the graph. Show all steps separately. Is there any limitation of this algorithm?	[4+1]	CO3	L-3,2



Q.3(b)	Define spanning tree of a graph. Explain what kind of data structures are used to implement Kruskal's algorithm to find a minimal spanning tree of a connected weighted graph? What is the worst-case time complexity of Kruskal's algorithm?	[2+2+1]	CO2	L-1,2
Q.4(a)	Compare and contrast between depth first search (DFS) and breadth first search (BFS) techniques for graph traversal.	[4]	CO5	L-2
Q.4(b)	Explain an algorithm to find topological sorted ordering of the vertices of a directed acyclic graph (DAG). Hence find a topological sorted order of the vertices of the following DAG:	[4+2]	CO5	L-2,3



Q.5(a) Explain how 4-Queen problem can be solved using backtracking. Draw the state space tree indicating at least one solution. [5] CO5 L-3

Q.5(b) Solve the following Assignment problem using Branch-and-Bound method. Draw the state space tree and number the nodes of the tree in the order of their generation. [5] CO1 L-5

	J1	J2	J3	J4
A	26	25	28	39
B	12	14	13	38
C	26	25	24	34
D	13	27	25	39

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