INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, SRI CITY

TERM-III EXAMINATION – MONSOON 2024

Subject Name: ADSA

CSE:UG2(PC) **Date: 23-11-2024**

Duration: 90 Mins (2:45-4:15 PM) **Max. Marks: 25**

Instructions: **Roll No:** S20230010047

1. All questions are compulsory.
2. Write the answers legibly.
3. Write Objective Type Questions Answers also in the Answer Sheet
4. Electronic Gadgets like mobile phones, laptops, smartwatches are not allowed.
5. Scientific Calculator is allowed

Section-A (Objective Type Questions)

1	Consider a graph with 5 vertices and the following adjacency matrix representing edge weights: 0 2 0 6 0 2 0 3 8 5 0 3 0 0 7 6 8 0 0 9 0 5 7 9 0 Starting from vertex 0, what is the total weight of the MST using Prim's Algorithm? a. 16 b. 17 c. 18 d. 19	**[1 Mark]**
2	A graph has 5 vertices and 8 edges. The shortest path from vertex 1 to vertex 5 using the Bellman-Ford Algorithm is found to be -3. If an additional edge with weight -2 is added between vertex 3 and vertex 5, what will be the new shortest path from vertex 1 to vertex 5? a. -5 b. -4 c. -3 d. -2	**[1 Mark]**

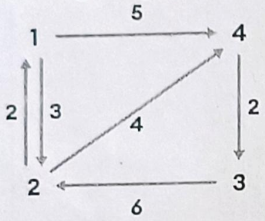
3	Given a connected, undirected graph with 7 vertices and 11 edges, the weights of the edges are distinct. How many edges will be included in the Minimum Spanning Tree (MST) using Kruskal's Algorithm? a. 6 b. 7 c. 8 d. 9	[1 Mark]
4	Which of the following is true about NP-Complete and NP-Hard problems. a. If we want to prove that a problem X is NP-Hard, we take a known NP-Hard problem Y and reduce Y to X b. The first problem that was proved as NP-complete was the circuit satisfiability problem. c. NP-complete is a subset of NP Hard d. All of the above	[1 Mark]
5	Which of the following options match the given statement: **Statement:** The algorithms that use the random input to reduce the expected running time or memory usage, but always terminate with a correct result in a bounded amount of time. a. Las Vegas Algorithm b. Monte Carlo Algorithm c. Atlantic City Algorithm d. None of the mentioned	[1 Mark]
6	_____ is the class of decision problems that can be solved by non-deterministic polynomial algorithms. a. NP b. P c. Hard d. Complete	[1 Mark]
7	What is the time complexity of the brute force algorithm used to solve the Knapsack problem? a. O(n) b. O(n!) c. O(2^n) d. O(n^3)	[1 Mark]

8	What will be the output when the following code is executed?
	#include<stdio>
	int fibo(int n)
	{
	int i;
	int fibo_terms[100];
	fibo_terms[0]=0;
	fibo_terms[1]=1;
	for(i=2;i<=n;i++)
	fibo_terms[i] = fibo_terms[i-2] + fibo_terms[i-1];
	return fibo_terms[n];
		[1 Mark]

```
}
int main()
{
    int r = fibo(8);
    printf("%d",r);
    return 0;
}
```

a. 34
b. 55
c. Compile error
d. 21

9 Let the given graph be: **[1 Mark]**



The minimum distances generated by using Floyd-Warshall algorithm is

A^3 =

	1	2	3	4
1	0	3	∞	5
2	2	0	∞	4
3	3	1	0	5
4	5	3	2	0

A^4 =

	1	2	3	4
1	0	3	x	5
2	2	0	y	4
3	3	1	0	5
4	5	3	2	0

Then find the values of x and y in the given final matrix.

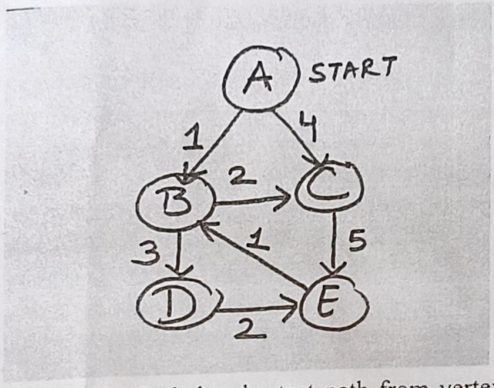
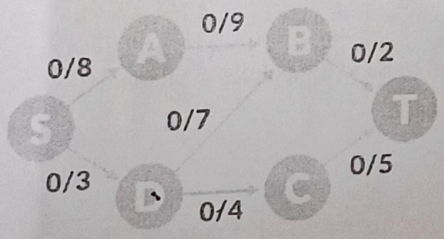
a. 6, 7
b. 7, 6
c. 9, 4
d. 9, 9

10 Consider two strings A="qpqrr" and B="pqprqrp". Let x be the length of the longest common subsequence (not necessarily contiguous) between A and B and let y be the number of such longest common subsequences between A and B. Then x + 10y = ___. **[1 Mark]**

a. 34
b. 33
c. 24
d. 23

P.T.O

Section-B (Subjective Type Questions)

1.	Consider the following graph with 5 vertices (A, B, C, D, E) and the given edge weights:  Using Dijkstra's Algorithm, find the shortest path from vertex A to vertex E. Show all the steps involved, including the updates to the distance and previous vertex arrays at each step. Finally, provide the shortest path and its total weight.	**[5 Marks]**
2	a. Given the directed graph below with the capacities of each edge shown, use the Ford-Fulkerson Algorithm to calculate the maximum flow from the source S to the sink T.  **Tasks**: 1. Identify the augmenting paths and their bottlenecks. 2. Compute the maximum flow through the network step by step. 3. Write the final maximum flow value and the flow distribution across edges.	**[5 Marks]**
3	Consider the DNA sequences *Seq1*= ATTTCGCGTAT and *Seq2* = ATCTCTACAT. Find any two Longest Common Subsequences (LCS) using dynamic programming. Note: Solve the problem step-by-step.	**[5 Marks]**