Printed Page:- 04 Subject Code:- ACSBS0501

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: V - THEORY EXAMINATION (2024-2025)

Subject: Design and Analysis of Algorithms

Time: 3 Hours Max. Marks: 100

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. This Question paper comprises of three Sections -A, B, & C. It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.

2. Maximum marks for each question are indicated on right -hand side of each question.

3. Illustrate your answers with neat sketches wherever necessary.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

6. No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION-A 20

1. Attempt all parts:-

1-a. The Complexity of Linear Search Algorithm: (CO1, K1) 1

(a) O(n)

(b) O(log n)

(c) O(nlog n)

(d) O(n2)

1-b. Which algorithm refers to defining the mathematical boundation/framing of its run-time performance. (CO1, K1) 1

(a) Symptotic analysis

(b) Asymptotic analysis

(c) Posterior Analysis

(d) Priori Analysis

1-c. Which of the following standard algorithms is not a Greedy algorithm? (CO2, K1) 1

(a) Dijkstra's shortest path algorithm

(b) Optimal substructure

(c) Memoization

(d) Greedy

1-d. If a problem can be solved by combining optimal solutions to non-overlapping problems, the strategy is called: (CO2, K1) 1

(a) Dynamic programming

(b) Greedy
(c) Divide and conquer
(d) Recursion

1-e. Time complexity of Depth First Search algorithm is: (CO3, K2) 1

(a) O(V lg E)
(b) O(E+V)
(c) O(lg V)
(d) O(E lg E)

1-f. Where is the n-queens problem implemented? (CO3, K1) 1

(a) carom
(b) chess
(c) ludo
(d) cards

1-g. The worst-case efficiency of solving a problem in polynomial time is:(CO4, K1) 1

(a) O(p(n))
(b) O(p(n log n))
(c) O(p(n^2))
(d) O(p(m log n))

1-h. Problems for which there exist no efficient algorithms to solve them are known as? (CO4, K1) 1

(a) intractable problems
(b) Tractable problems
(c) decision problems
(d) complete problems

1-i. The sum and composition of two polynomials are always polynomials. (CO5, K2) 1

(a) worst case
(b) best case
(c) average case
(d) none of the mentioned

1-j. Problems that can be solved in polynomial time are known as? (CO5, K2) 1

(a) time bound
(b) Space bound
(c) Both
(d) None of these

2. Attempt all parts:-

2.a. Write the difference between an Algorithm and a Program . (CO1, K4) 2

2.b. What are the properties of Dynamic Programming? (CO2, K1) 2

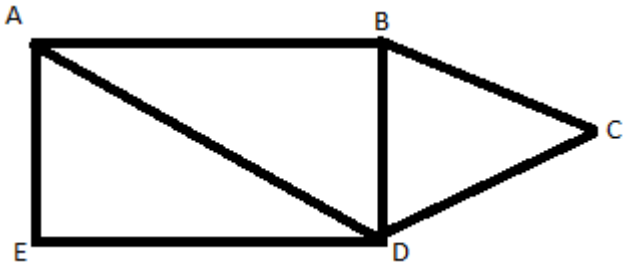
2.c. Explain Negative weighted cycles. (CO3, K2) 2

2.d.	Define deterministic problem. (CO4, K1)	2
2.e.	Write short note on Approximation Algorithm. (CO5, K1)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Compare between Iterative and recursive algorithm. (CO1, K4)	6
3-b.	Find the time complexity of the recurrence relation. (CO1, K3) T(n)= n +T(n/10)+T(7n/5)	6
3-c.	What are the differences between the top-down approach and the bottom-up approach? (CO2, K4)	6
3-d.	Compare and contrast dynamic programming and divide and conquer approach? (CO2, K4)	6
3.e.	Implement Kruskal's algorithm and analyze it's time complexity in steps. (CO3, K3)	6



3.f.	Define Vertex cover problem and also prove that vertex cover Problem is NP-Complete problem.(CO4, K1,K5)	6
3.g.	Explain the approximation algorithm for the travelling salesman problem (TSP). (CO5, K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Solve the recurrence relation ? By using back Substitution Method. (CO1, K3) T(n)=1 n=0 T(n)=T(n-1)+1 n>0	10

4-b.	From the given algorithm form a recurrence relation T(n)
	And Solve the recurrence relation T(n)? By using recursive tree Method or Back Substitution method . (CO1, K4)
	void test(int n)
	{
	if(n>0)
	{
	for(i=1;i<n;i=i*2)
	{
	printf("%d",i);
	}
	test(n-1);
	}
		10

}

5. Answer any <u>one</u> of the following:-

5-a. Describe Brute force algorithm. Differentiate Greedy algorithm and Dynamic Programming? (CO2) 10

5-b. Consider the sum-of-subset problem n= 4 'Sum=13' and wt1=3 'wt2=4 wt3=5 and wt4=6. Find a solution to the problem using backtracking. Show the state-space tree leading to the solution. Also number the nodes in the tree in the order of recursion calls. (CO2, K3) 10

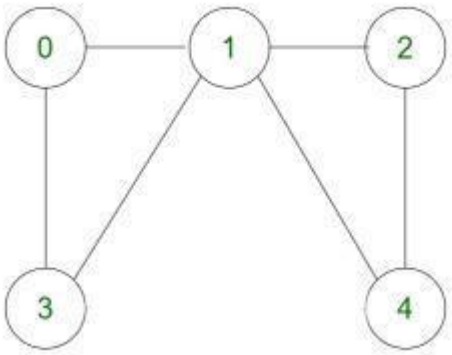
6. Answer any <u>one</u> of the following:-

6-a. Demonstrate Network Flow Algorithm. What does source and sink represent in Network Flow Algorithm? Write the five applications of Network Flow Algorithm. (CO3, K3, K1) 10

6-b. Explain the term "minimum spanning tree". By using a suitable graph implement Prim's algorithm to find minimum spanning tree and write down its applications. (CO3, K2,K3) 10

7. Answer any <u>one</u> of the following:-

7-a. Discuss Hamiltonian path. Why is it used? Find the hamiltonian path of the following graph. (CO4, K2,K3) 10



7-b. Let w={5,7,10,12,15,18,20} and m=35.Compute all possible subset of w whose sum is equivalent to m. Draw the portion of state space tree for this problem. (CO4, K3) 10

8. Answer any <u>one</u> of the following:-

8-a. Relate how Approximation algorithms deals with NP-Complete problems? Compare Randomized algorithm and Approximation algorithm. (CO5, K4) 10

8-b. Describe Quantum algorithm. Write down the application of Quantum algorithm. (CO5, K2) 10