SVKM'S NMIMS

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT& ENGINEERING

Academic Year: 2022-2023

Program: B Tech / MBA Tech

Year: II Semester: IV

Streams: Computer Engineering /CS

Subject: Design and Analysis of Algorithms

Time:3hrs (10:00am to 01:00pm)

Date: 30/June/ 2023

No. of Pages:3

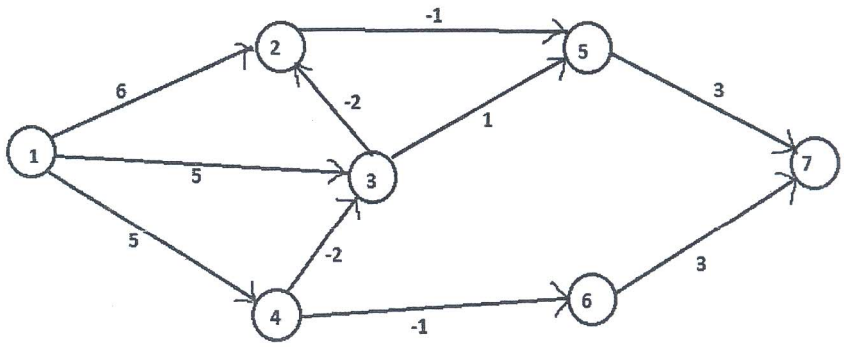
Marks: 100

Re-Examination (2021-22/2022-23)

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is provided for their use.

1) Question No. _1___ is compulsory.
2) Out of the remaining questions, attempt any __4___ questions.
3) **In all ___5_ questions to be attempted.**
4) All questions carry equal marks.
5) **Answer to each new question to be started on a fresh page.**
6) **Figures in brackets on the right-hand side indicate full marks.**
7) **Assume Suitable data if necessary.**

Q1		Answer briefly:	[20]
CO-1; SO-1; BL-1	a.	What is an algorithm? Explain any three needs of an algorithm.	5
CO-1; SO-1; BL-2	b.	Compare the growth of functions: $f(n) = n^2 \log n$ and $g(n) = n(\log n)^{10}$	5
CO-2; SO-6; BO-3	c.	Illustrate the efficiency analysis of the Divide & Conquer strategy.	5
CO-3; SO-2; BL-2	d.	Discuss the difference between a feasible solution and an optimal solution in the greedy method with an example. Can more than one optimal solution is possible, if yes, then justify your answer?	5
Q2 CO-1; SO-1; BL-2 CO-4; SO-6,7; BL-2,4	a.	Discuss any four types of algorithms with an example	[10]
	b.	Explain in detail the subset sum problem using Exhaustive Search Algorithm and backtracking with an example. Discuss its time complexity.	[10]
Q3 CO-1; SO-1; BL-2	a.	Discuss all the cases of the Master theorem. Solve the following recurrence relation using Master's theorem- T(n) = 2T(n/2) + nlogn T(n) = 3T(n/3) + n/2	[10]
CO-3; SO-2; BL-3	b.	Discuss the algorithm of optimal storage on tapes and also find the optimal ordering of the program if the total number of programs (n) = 3, and the length of each program (l1, l2, l3) = (8, 12, 2). respectively. Then	[10]

		determine the optimal ordering of the program on tape in the order the retrieval time is minimized. Also, explain its time complexity.	
Q4 CO-2; SO-6; BL-5 CO-4; SO-1; BL3	a. b.	Compare the divide & conquer approach of the Min-Max algorithm over the Naiive method in terms of time complexity analysis. Also, identify the number of comparisons required for 400 elements for both methods. Find the optimal solution for following the 0/1 knapsack problem using dynamic programming. Capacity: 6, Weights: (1,2,4) Profits: (10, 12, 28) Interpret its algorithm and time complexity.	[10] [10]
Q5 CO-3; SO-2; BL3 CO-4; SO-1; BL2 CO-4; SO-6,7; BL-2,4	a. b. c.	Discuss the algorithm of Job sequencing with deadline using the greedy method and also Solve the following instance of the "Job scheduling with deadlines" problem: n = 5, profits (p1, p2, p3, p4, p5) = (3, 5, 15, 16, 1) and deadlines (d1, d2, d3, d4, d5) = (1, 3, 4, 3, 2). Schedule the jobs in such a way as to get maximum profit. Explain its time complexity. Explain the control abstraction of Dynamic Programming. How it is different from the greedy approach What is the difference between Backtracking and Recursion?	[10] [5] [5]
Q6 CO-1; SO-1; BL-2 CO-4; SO-1; BL3	a. b.	What do you understand by recurrence relation? Explain with an example. Solve the following recurrence relation using the recursion tree method- $T(n) = 2T(n/2) + n$ when $n > 1$ Apply dynamic programming to find all pair shortest paths from source 1. Interpret its algorithm, and complexity.  	[10] [10]

Q7 CO-4; SO-1; BL3	a.	Find the Longest Common Subsequence for the following strings: X = ABCDBACDF Y = CBAF Interpret its algorithm and time complexity.	[10]
CO-1; SO-1; BL-1	b.	Explain P and NP problems	[5]
CO-2; SO-6; BO-4	c.	Differentiate Quicksort and Mergesort in terms of time complexity analysis.	[5]