SVKM'S NMIMS

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT& ENGINEERING

Academic Year: 2022-2023

Program/s: _ B. Tech Computer Science and Engineering — Year: _II_ Semester: _IV_

Stream/s; Data Science

Subject: Design and Analysis of Algorithms — Time: _3_ hrs. (10:00 am to 1:00 pm)

Date: 01 /07 / 2023 — No. of Pages: _3_

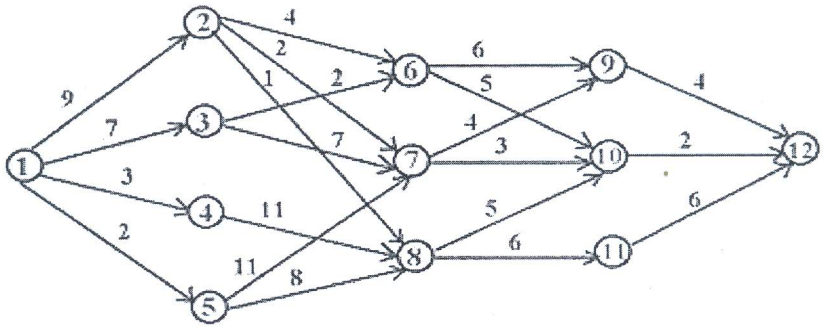
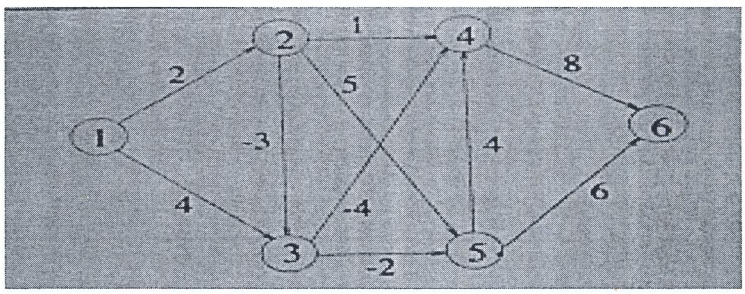
Marks: _100_

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 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-5	a.	Explain P, NP, NP complete and NP hard complexity classes. Describe their significance in analysis of algorithms?	[5]
CO-2 ; SO-2 ; BL-2	b.	State the control abstraction for Greedy technique? Explain the main objective of Greedy algorithms?	[5]
CO-1 ; SO-1 ; BL-4	c.	What is recursion tree method? How it helps in finding complexity of algorithms, explain with suitable example.	[5]
CO-3 ; SO-2 ; BL-4	d.	Consider an instance of Sum of Subset problem where X = {10,20,30,40} and Y = 50, Generate state space tree to find two possible subsets of 'X' that sum to 'Y' using Backtracking method.	[5]
Q2 CO-2,3; SO-2; BL-3	a.	Write an algorithm to sort an array using Quick Sort method. Derive its recurrence relation and discuss worst-case time complexity?	[10]
	b.	Explain the Matrix Chain Multiplication problem in detail. Apply dynamic programming method to solve a suitable example.	[10]
Q3 CO-3; SO-2; BL-2	a.	what is Longest Common Subsequence (LCS) problem? Find the LCS for the strings "abebotcin" and "aenptxifn" using dynamic programming. Analyze its time complexity.	[10]

	b.	What is Minimum cost Spanning Tree? Write the pseudocode for Prim's algorithm and derive its time complexity.	[10]
Q4 CO-3; SO-2; BL-4	a. b.	Explain in detail the greedy approach used for Job Sequencing with deadlines using suitable example. What are its applications? What do you mean by Multistage Graph? Solve the following multistage graph problem to find minimum cost path from node 1 to node 12, using Forward approach of dynamic programming.  	[10] [10]
Q5 CO-3; SO-2; BL-2	a. b.	Apply divide and conquer method on following data set to find minimum and maximum. Explain with the help of recursion tree. Also Discuss its time complexity. **28, 14, -4, 89, -9, 60, 14, 31, 99** Apply Huffman coding as Greedy method on the given string and construct Huffman codes: - **"duke blue devils."** Also, what is the purpose of using Huffman encoding as greedy technique.	[10] [10]
Q6 CO-3; SO-2; BL-4	a.	Find the shortest paths from node 1 to every other node in the graph given below using Bellman-Ford algorithm. Discuss the drawback in Bellman Ford method?  	[10]

	b.	Discuss best case, worst case, and average case in terms of asymptotic notations for computing time complexity of an algorithm with suitable example.	[10]
Q7 CO-4; SO-2; BL-4	a.	What is n-queens problem? Solve the 4-Queens problem using Backtracking, also draw its state space tree.	[10]
	b.	Explain the different Asymptotic notations used to represent time complexity of algorithms? How they are useful in asymptotic analysis?	[10]