Hall Ticket Number:

Code No. : 14225

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

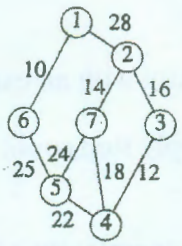
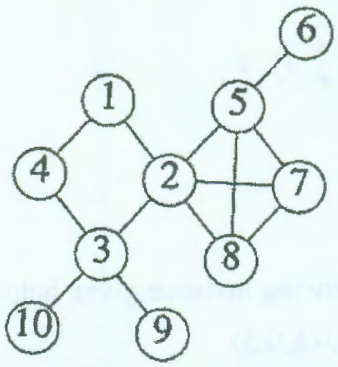
B.E. (C.S.E. : CBCS) IV-Semester Main Examinations, January-2021.

Design and Analysis of Algorithms

Time: **2** hours Max. Marks: **60**

*Note: Answer any **NINE** questions from **Part-A** and any **THREE** from **Part-B***

Part-A (9 × 2 = 18 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Write an algorithm to transpose a matrix of order n X m. Find the space complexity.	2	2	1	1,2
2.	Show that the following equalities are correct i) $5n^2 - 6n = \Theta(n^2)$ ii) $\frac{6n^3}{(\log n+1)} = O(n^3)$	2	3	1	1
3.	Write control abstraction of divide and conquer.	2	2	2	1
4.	Find the minimum cost spanning tree for the graph given below using Kruskal's algorithm 	2	3	2	1,2
5.	Consider the following adjacency matrix, find the shortest path from every node to other nodes. $\begin{bmatrix} 0 & 4 & 11 \\ 6 & 0 & 2 \\ 3 & \infty & 0 \end{bmatrix}$	2	3	3	1,2
6.	Find the Bi-connected components of the following graph 	2	3	3	1,2

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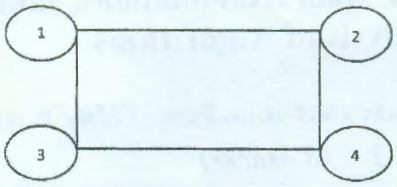
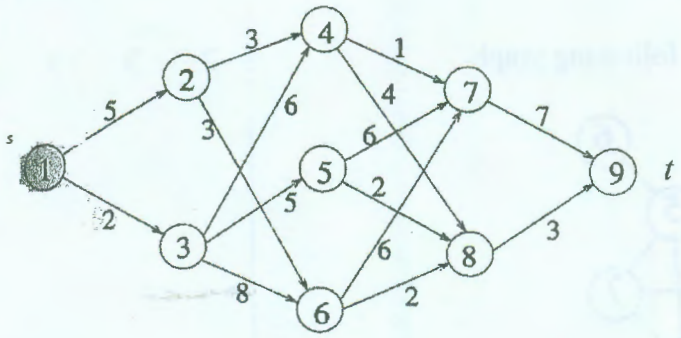
7.	Draw the space tree for the graph given below with 3 colors 	2	2	4	1,2
8.	Consider n=3, m=20, (P1,P2, P3) = (25,24,15), (W1,W2,W3)= (18,15,10). Find the profit for the 0/1 knapsack problem using LCBB	2	3	4	1,2
9.	Define NP hard and NP complete problems.	2	2	5	1,2
10.	Write nondeterministic algorithm for Searching operation	2	2	5	1,2
11.	Find the Time complexity of the following recurrence relation using substitution method T(N)= 2 T(N/2) + C, where T(0)=1	2	3	1	1
12.	Show how Quicksort sorts the following sequence of keys 1,1,1,1,1,1,1,1	2	3	2	1,2
	Part-B (3 × 14 = 42 Marks)				
13. a)	Explain asymptotic notations used for time complexity with an example	7	2	1	1,2
b)	Write an algorithm to find matrix multiplication. Apply step count method and step table method to find time complexity.	7	3	1	1,2
14. a)	Write an algorithm for Merge Sort. Find the time complexity of Merge Sort algorithm	7	3	2	1,2
b)	What is the solution generated by the function JobSequencing when n=7, (P1,P2,…..P7) = (3,5,20,18,1,6,30) and (d1,d2,…..d7) = (1,3,4,3,2.1,2)	7	3	2	1,2
15. a)	Find the shortest path from source (s) to destination (t) by using Backward approach. 	8	3	3	1,2
b)	Explain Reliability design problem for the following instance given below C= 106, (c1,c2,c3)=(30,15,20), (r1,r2,r3)=(0.9,0.8,0.5)	6	3	3	1,2

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16. a)	Solve the given cost matrix to find the traveling sales person problem using LCBB. $\begin{matrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{matrix}$	7	3	4	1,2
b)	Describe the Backtracking solution to find Hamiltonian cycle. Explain with an example.	7	3	4	1,2
17. a)	Explain clique decision problem.	7	3	5	1,2
b)	Write nondeterministic algorithm for sorting of an array.	7	2	5	1,2
18. a)	Explain about the pseudo code conventions used for algorithm specification.	7	2	1	1,2
b)	Design a ternary search algorithm that first tests the element at position n/3 for equality with the key value x, and then checks the element at 2n/3 and either discovers x or reduces the set size to one-third the size of original. Compare the time complexity with the binary search.	7	3	2	1,2
19.	Answer any ***two*** of the following:				
a)	Consider n=4 and (q 1 , q 2 , q 3 , q 4) = (do, if, int, while) the values for P's and q's are given as P(1:4) = (3, 3, 1, 1) and q(0:4) = (2, 3, 1, 1, 1). Construct the optimal binary search tree.	7	3	3	1,2
b)	Describe the n-queens problem using backtracking	7	2	4	1,2
c)	State and Prove Cooks theorem	7	3	5	1,2

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	30
2	Knowledge on application and analysis (Level-3 & 4)	70
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	--

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