CBCS SCHEME

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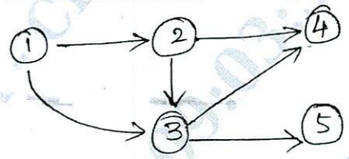
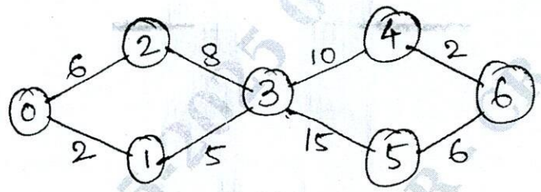
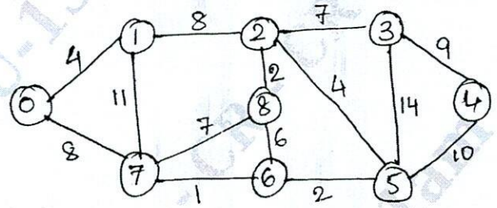
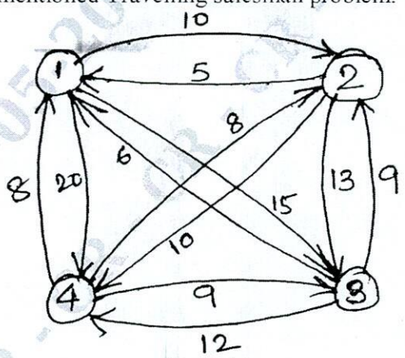
22MCA15

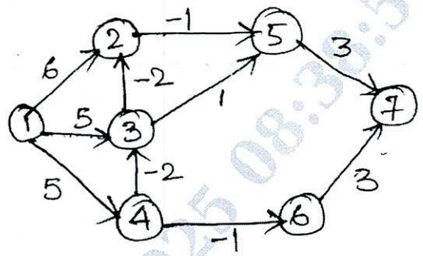
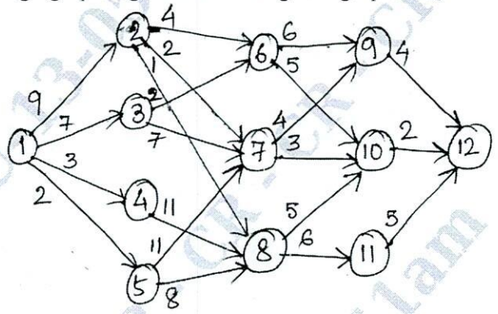
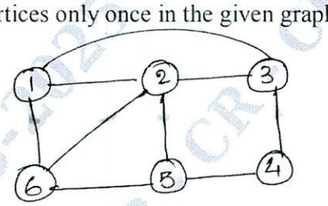
First Semester MCA Degree Examination, Dec.2024/Jan.2025
Design and Analysis of Algorithms

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define algorithm and discuss the characteristics of a good algorithm.	5	L1	CO1
	b.	Explain Asymptotic notations with a diagram and explain with examples.	10	L1	CO1
	c.	Outline an algorithm to find maximum of n elements and calculate its time complexity.	5	L2	CO1
		OR			
Q.2	a.	Prove the theorem : If $f_1(n) \in o(g_1(n))$ and $f_2(n) \in o(g_2(n))$ then $f_1(n) + f_2(n) \in o(\max\{g_1(n), g_2(n)\})$	10	L3	CO1
	b.	Design a general plan for analyzing recursive algorithms. Explain with an example.	10	L1	CO1
		Module – 2			
Q.3	a.	Apply Topological sort on the graph given by considering the Vertex in degrees. Also write C code for the same.  Fig Q3(a)	12	L3	CO1
	b.	Write Quicksort algorithm and apply the same on the following numbers. Show till the 1st partition. 24, 9, 29, 14, 19, 27.	8	L3	CO1
		OR			
Q.4	a.	Explain divide and conquer. What are its advantages and disadvantages? How is it different from decrease and conquer and transform and conquer.	10	L1	CO2
	b.	Discuss Stassen's matrix multiplication algorithm and explain how it applies divide and conquer.	10	L1	CO2
		Module – 3			
Q.5	a.	Apply Huffman coding algorithm on the following data : Character: P Q R S T Frequency: 35 10 20 20 15 Create : (i) Huffman Tree (ii) Decode 100110110100110.	10	L3	CO2

	b.	Apply greedy technique to solve the following knapsack problem. Weight: 1 3 4 5 Profit: 1 4 5 7 Find the items to be included and write the algorithm. Maximum weight capacity in 7.	10	L3	CO2
		OR			
Q.6	a.	Consider the oth vertex as the source and find the shortest path to all other vertices from it.  Fig Q6(a)	10	L3	CO2
	b.	Write Prim's algorithm and apply the same on the following graph.  Fig Q6(b)	10	L3	CO2
		Module – 4			
Q.7	a.	Apply dynamic programming technique to solve the following knapsack problem. Max weight is 7. Items: I_1 I_2 I_3 I_4 Weight: 1 3 4 5 Value: 1 4 5 7	10	L3	CO3
	b.	Solve the below mentioned Travelling salesman problem.  Fig Q7(b)	10	L3	CO3

		OR			
Q.8	**a.**	Write Bellman Ford Algorithm, apply on the given graph and mention the drawback.  Fig Q8(a)	**10**	**L3**	**CO3**
	b.	Apply multistage graph algorithm on the given graph.  Fig Q8(b)	**10**	**L3**	**CO3**
		Module – 5			
Q.9	**a.**	Write N-Queen's problem algorithm and apply back tracking method for n = 4.	**10**	**L4**	**CO3**
	b.	Write Pseudo-code for Hamiltonian cycle problem and check if it is possible to visit all vertices only once in the given graph.  Fig Q9(b)	**10**	**L3**	**CO3**
		OR			
Q.10	**a.**	Find the subset from the given set where sum = 11 and set = {2, 3, 7, 8, 10} by constructing the state space tree.	**10**	**L4**	**CO3**
	b.	Explain with an example what is a non-deterministic algorithm. Given that SAT is a NP – Hard problem, prove that 0/1 knapsack is also NP-Hard.	**10**	**L4**	**CO3**

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