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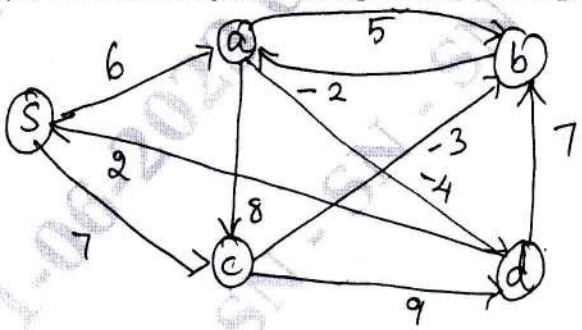
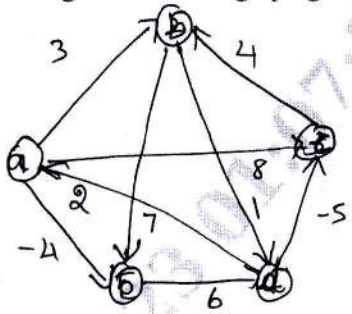
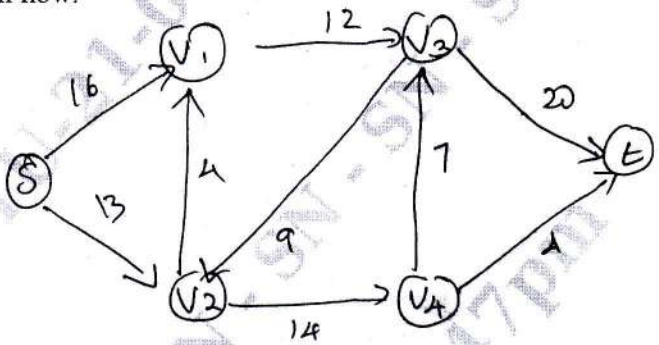
22SCS15

First Semester M.Tech. Degree Examination, Jan./Feb. 2023
Advanced 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.	Describe the asymptotic notations used for running time of an algorithm with examples.	10	L2	CO1
	b.	Using substitution method, solve the following recurrence relation to give an upper and lower bound: $T(n) = 2T(n / 2) + n$.	5	L3	CO1
	c.	Construct a recursion tree for the recurrence, $T(n) = 3T(n/4) + cn^2$ and indicate the running time.	5	L2	CO1
		OR			
Q.2	a.	Using master method, solve the following recurrences: i) $T(n) = 3T(n/4) + n \log(n)$ ii) $T(n) = 4T(n/2) + n$ iii) $T(n) = 9T(n/3) + n$ iv) $T(n) = 8T(n/2) + n^2$ v) $T(n) = T(2n/3) + 1$.	10	L3	CO1
	b.	Define amortized analysis. Explain accounting method with an example.	10	L2	CO1
		Module – 2			
Q.3	a.	Find the single source 'S' shortest path using Bellman-Ford algorithm for the given graph. Write the analysis of the algorithm (Refer Fig.Q.3(a)).  Fig.Q.3(a)	10	L2	CO2
	b.	Briefly explain the following: i) Flow N/Ws ii) Residual networks iii) Cuts iv) Augmenting paths.	10	L2	CO2

		OR			
Q.4	**a.**	Write the Johnson algorithm to solve all pairs shortest path problem for sparse graphs and run the algorithm on the graph given in the Fig.Q.4(a).  Fig.Q.4(a)	**10**	**L3**	**CO2**
	b.	Write the basic Ford-Fulkerson algorithm for maximum flow problem and apply the algorithm on the graph shown in Fig.Q.4(b) and Find the maximum flow.  Fig.Q.4(b)	**10**	**L2**	**CO2**
		Module – 3			
Q.5	**a.**	Write the extended Euclid's algorithm and also find a GCD (99, 78) using the same.	**10**	**L2**	**CO2**
	b.	Define Group. When it is called abelian group? Give a table for group operation multiplication modulo 15 and show that it is an abelien group.	**10**	**L2**	**CO2**
		OR			
Q.6	**a.**	Apply the Chinese remainder theorem to the following equations: $a \equiv 2 \pmod 5$ $a \equiv 3 \pmod{13}$ Generate all the solutions in the form of a table.	**10**	**L3**	**CO2**
	b.	Write the procedure for RSA public-key crypto system. Apply it for the following input p = 3 and q = 11, e = 7 compute d and encrypt M = 2.	**10**	**L3**	**CO2**
		Module – 4			
Q.7	**a.**	Write a Rabin-Karp string matching algorithm. Search for a pattern 26 in the text string 3141592653589793 with 9 = 1.	**10**	**L2**	**CO3**
	b.	Discuss KMP matcher algorithm with steps. Find pattern 001002 in text 001001002000100201.	**10**	**L2**	**CO3**

		OR			
Q.8	**a.**	Explain finite – automation algorithm and construct the string matching automatic for pattern P = ababaca and illustrate its operation on the text string T = abababacaba.	**10**	**L2**	**CO3**
	b.	Write Boyer-Moore algorithm for string matching problem. Illustrate it on the following input: Text : BESS_KNEW_ABOUT_BAOBAB Pattern : BAOBAB.	**10**	**L2**	**CO3**
		Module – 5			
Q.9		Write a note on probabilistic algorithms and randomizing deterministic algorithm.	**20**	**L2**	**CO3**
		OR			
Q.10		Explain Monte Carlo and Las Vegas algorithms with example.	**20**	**L2**	**CO3**

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