CBCS SCHEME

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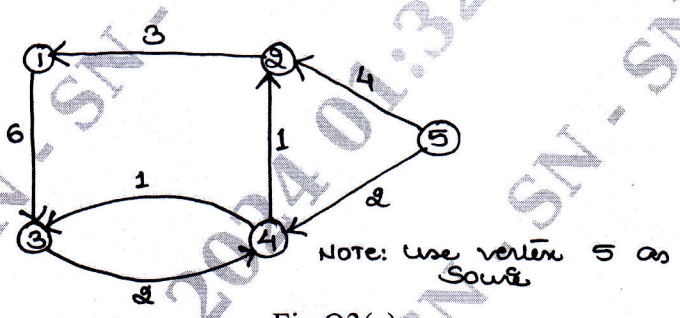
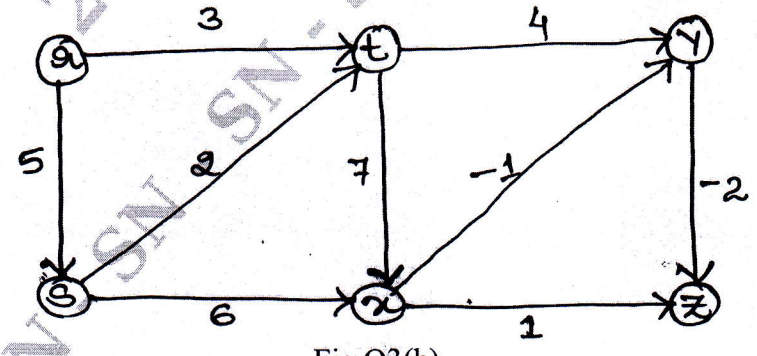
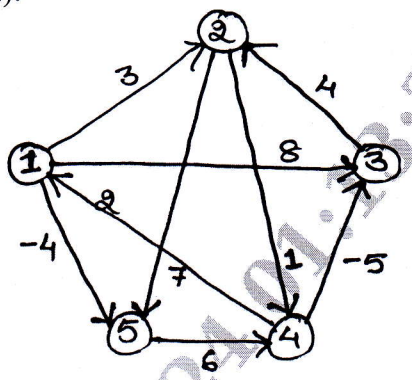
22SCS15

First Semester M.Tech Degree Examination, Dec.2023/Jan.2024
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.

			M	L	C
		Module – 1			
Q.1	**a.**	Explain the following asymptotic notations : 0, Ω, θ with suitable examples.	**10**	**L2**	**CO1**
	b.	Apply recursion Tree method to find solution to the recurrence $T(n) = 3T(n/4) + Cn^2$. Use the substitution method to verify your answer.	**10**	**L2**	**CO1**
		OR			
Q.2	**a.**	Define amortized analysis. Explain accounting method with an example.	**10**	**L2**	**CO1**
	b.	Define master theorem. Solve $T(n) = T(2n/3) + 1$ using the same.	**10**	**L2**	**CO1**
		Module – 2			
Q.3	**a.**	Write Bellman – Ford algorithm for solving single – source shortest paths problems. Trace it for the following graph. Refer Fig.Q3(a).  Fig.Q3(a)	**10**	**L2**	**CO1**
	b.	Find the shortest path from the source vertex 'r' to the remaining vertices in DAG, using DAG shortest path algorithm. Refer Fig.Q3(b).  Fig.Q3(b)	**10**	**L2**	**CO1**

		OR			
Q.4	**a.**	Explain the Johnson's algorithm and apply the same for the following graph : Refer Fig.Q4(a).  Fig.Q4(a)	**10**	**L2**	**CO1**
	b.	Describe how to find maximum bipartite matching for a given graph, considering suitable example.	**6**	**L2**	**CO1**
	c.	Define FFT and DFT.	**4**	**L1**	**CO1**
		Module – 3			
Q.5	**a.**	Define group. Prove that the system $(Zn^*, \bullet n)$ is a finite abelian group.	**10**	**L2**	**CO2**
	b.	Explain Chinese remainder theorem. Find all possible solutions for the set equations : $x \equiv 4 \pmod 5$, $x \equiv 5 \pmod{11}$.	**10**	**L2**	**CO2**
		OR			
Q.6	**a.**	Write RSA public key cryptosystem algorithm and solve the following problem with p = 11, q = 29, η = 319 and c = 3 find the value of d and encrypt the message 100.	**10**	**L2**	**CO2**
	b.	Give extended Euclid algorithm to find GCD of integers and apply the algorithm for (99, 78).	**10**	**L2**	**CO2**
		Module – 4			
Q.7	**a.**	Write a Robin – Karp string matching algorithm. search for a pattern 31415 in the text string 2359023141526739921 with q = 13.	**10**	**L2**	**CO2**
	b.	Show the comparison the naïve string matcher makes from pattern P = 0001 in the text T = 00001000101.	**10**	**L2**	**CO2**
		OR			
Q.8	**a.**	Write Finite – Automata – Matcher algorithm and construct the string – matching automata for the pattern P = aabab and illustrate its operation on text string T = aaababaabaababaab.	**10**	**L2**	**CO2**
	b.	Write Boyer – Moore algorithm for string matching problem. Illustrate it on the following input : Text T : which_Finally_Halts_ _ at _ that Pattern P : at _ that.	**10**	**L2**	**CO2**
		Module – 5			
Q.9	**a.**	Explain Monte – Carlo and Las Vegas algorithm with appropriate examples.	**10**	**L2**	**CO3**
	b.	Explain in detail the Miller – Rabin randomized primality testing algorithm.	**10**	**L2**	**CO3**
		OR			
Q.10		Write a note on probabilistic algorithm and randomizing deterministic algorithms.	**20**	**L2**	**CO3**

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