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18SCS22

Second Semester M.Tech. Degree Examination, June/July 2019 Advanced Algorithms

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Describe the asymptotic notations used for running time of an algorithm with examples. (10 Marks)
- b. Explain substitution method for solving recurrences. Determine an upper bound on the recurrence i) $T(n) = 2T(n/2) + n$ ii) $T(n) = 2T(\sqrt{n}) + \lg n$ (10 Marks)

OR

- 2 a. Explain the recursion tree method for solving recurrences. Draw recursion tree for the recurrence $T(n) = T(n/3) + T(2n/3) + cn$ and use the substitution method to verify that $O(n \lg n)$ is an upper bound for the solution to the recurrence. (10 Marks)
- b. Explain Master method for solving recurrences. Use master method and determine which case of the master theorem applies and write down the answer for the following:
i) $T(n) = 9T(n/3) + n$ ii) $T(n) = 2T(n/4) + n^2$ (10 Marks)

Module-2

- 3 a. Find the shortest path from the source vertex 'S' to the remaining vertices for the graph shown in Fig.Q.3(a) using Bellman Ford algorithm. (10 Marks)

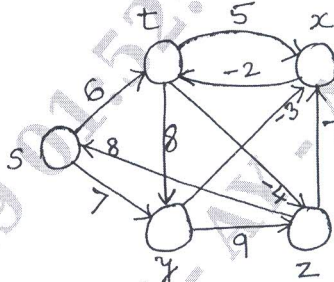


Fig.Q.3(a)

- b. Write the Johnson's algorithm to solve all pairs shortest path problem for sparse graphs and run the algorithm on the graph given in the Fig.Q.3(b). (10 Marks)

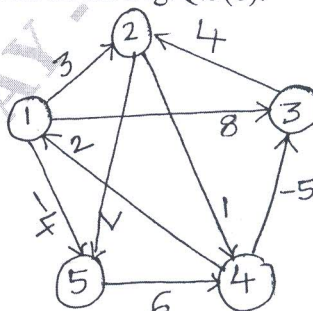


Fig.Q.3(b)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, $42+8=50$, will be treated as malpractice.

OR

- 4 Write the basic Ford-Fulkerson algorithm for maximum flow problem and apply the algorithm on the graph shown in Fig.Q.4 and find the maximum flow. (20 Marks)

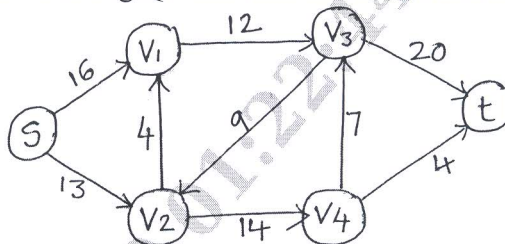


Fig.Q.4

Module-3

- 5 a. Write Modular_Linear_Equation_Solver algorithm and explain the operation of this procedure consider the equation $14x \equiv 30 \pmod{100}$. (10 Marks)
 b. Explain the Chinese remainder theorem. Find all integers x that leave remainders 1, 2, 3 when divided by 9, 8, 7 respectively. (10 Marks)

OR

- 6 a. Write the modular exponential algorithm. Apply this procedure where 'a' is 7 'b' is 560 and $n = 561$ for $a^b \pmod{n}$ i.e. $7^{560} \pmod{561}$. (10 Marks)
 b. Explain the RSA public key cryptosystem. Consider an RSA keyset with $P = 11$, $q = 29$, $n = 319$ and $e = 3$. What value of 'd' should be used in secret key. What is encryption of the message $M = 100$. (10 Marks)

Module-4

- 7 a. Write Rabin-Karp matcher algorithm. Working modulo $q = 11$, how many spurious hits does the Rabin-Karp matcher encounter in the text. $T = 3141592653589793$ when looking for the pattern $P = 26$. (10 Marks)
 b. Write finite automaton matched algorithm. Draw a state transition diagram for the string matching automation that accepts all strings ending in the string "ababaca" and show that operation of the automation on the test $T = abababacaba$. (10 Marks)

OR

- 8 a. Write KMP matched algorithm. Compute the prefix function for the pattern "ababaca". (10 Marks)
 b. Explain Boyer Moore algorithm. Compute the bad match table for the pattern VTU and match the pattern in the text $T = WELCOME TO VTU$. (10 Marks)

Module-5

- 9 Write a note on probabilistic algorithms and randomizing deterministic algorithms. (20 Marks)

OR

- 10 Explain Monte Carlo and Las Vegas algorithms with examples. (20 Marks)
