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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)**

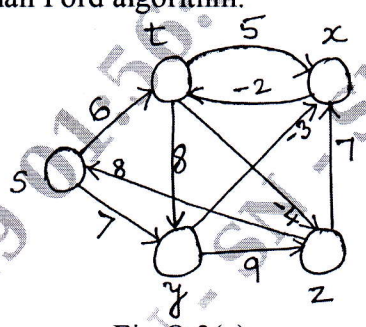

Fig.Q.3(a)

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)**

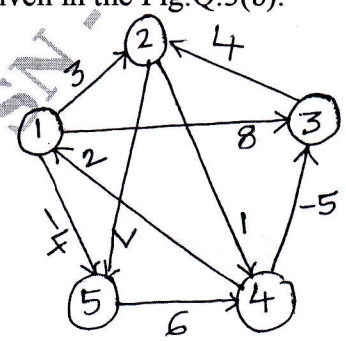

Fig.Q.3(b)

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)**

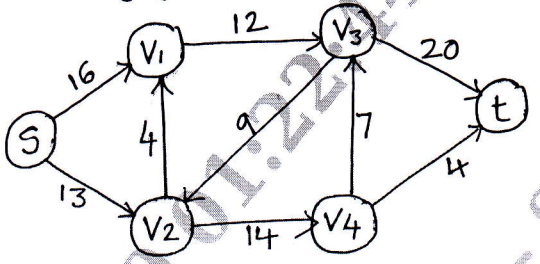

Fig.Q.4

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)**

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