CBCS SCHEME

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20SCS14

First Semester M.Tech. Degree Examination, Jan./Feb. 2021
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. Explain the various Asymptotic notations with related graphs and suitable examples. **(08 Marks)**

b. Use a recursion tree to determine a good asymptotic upper bound on the recurrence relation $T(n) = 3T(n/4) + Cn^2$. **(08 Marks)**

c. State the Master theorem and solve the following recurrence relations using Master theorem. $T(n) = 2T(n/2) + n$. **(04 Marks)**

OR

2 a. Define Amortized Analysis. Explain the Accounting method of Amortized analysis. **(08 Marks)**

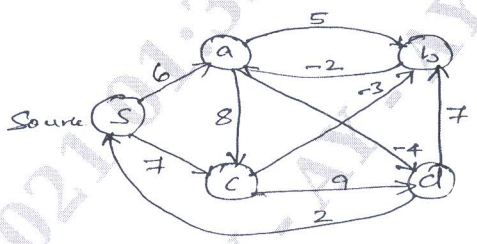
b. Explain the aggregate analysis techniques used in amortized analysis using multipop stack and binary counter problems. **(08 Marks)**

c. Using substitution method, solve the following recurrence relation $T(n) = 2T(n/2) + \theta(n)$. **(04 Marks)**

Module-2

3 a. Write the Complete Bellman – Ford Algorithm with initialize and Relax functions for solving single source Shortest path problem. Trace it for the graph. Shown in Fig. Q3(a). **(10 Marks)**

Fig. Q3(a)



b. Describe how to find maximum bipartite matching for a given graph, considering suitable example. **(05 Marks)**

c. Write and explain Interative FFT. **(05 Marks)**

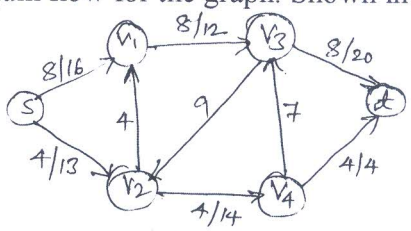
OR

4 a. Write Johnson's Algorithm to solve. All – pairs shortest path problem. **(05 Marks)**

b. Explain the point value representation of a polynomial with examples. **(05 Marks)**

c. Give Ford – Fulkerson Algorithm for solving the maximum flow problem. Apply the same algorithm to find the maximum flow for the graph. Shown in Fig. Q4(c). **(10 Marks)**

Fig. Q4(c)



Module-3

5 a. Write extended Euclid's algorithm for computing GCD of two numbers. Find gcd(99, 78) , using extended Ecludian algorithm and show the computation steps at each level of recursion. **(06 Marks)**

b. Discuss the Chainese remainder theorem. Find solution to the equation $a \equiv 2 \pmod 5$ and $a \equiv 3 \pmod{13}$. **(10 Marks)**

c. Define a group and list its properties. **(04 Marks)**

OR

6 a. Write the procedural steps of the RSA public key cryptosystem. Also, consider an RSA key set with P = 61 , q = 53 and e = 17. What value of d should be used in the secret key? What is the encryption of the message M = 65? **(10 Marks)**

b. Write and explain an algorithm to solve modular linear equation. **(05 Marks)**

c. Write an algorithm to find factors of small numbers using 'Pollard – Rho'. **(05 Marks)**

Module-4

7 a. Explain string matching with Finite Automation. Also write the same transition diagram and the transition function of the string matching automation that accepts all the strings containing the pattern P = ababaca. **(10 Marks)**

b. Write Compute – prefix function of Knuth – Morris – Pratt algorithm. Apply it on the pattern a b a b a b a b c a. Indicate the running time of KMP algorithm. **(10 Marks)**

OR

8 a. Write and explain the Rabin – Karp string matching algorithm. Working modulo q = 13, demonstrate this algorithm for the test 2 3 5 9 0 2 3 1 4 1 5 2 6 7 3 9 9 2 1 and pattern 3 1 4 1 5. **(10 Marks)**

b. Write Bayer – Moore string matching algorithm. Illustrate it on the input.
Text : BESS_KNEW_ABOUT_BAOBABS
Pattern : BAOBAB. **(10 Marks)**

Module-5

9 a. Describe how to randomize the deterministic algorithm considering the following problems :
i) Linear Search Algorithm ii) Quick Sort Algorithm. **(10 Marks)**

b. Write and explain Manto Carlo Algorithm for testing polynomial equality, with the help of suitable example. **(10 Marks)**

OR

10 a. Write and explain probabilistic and Randomizing deterministic algorithms with an example. **(10 Marks)**

b. Describe Las Vegas algorithm for the problem of searching a list with repeated elements. **(10 Marks)**

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