CBCS SCHEME

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20SCS14

First Semester M.Tech. Degree Examination, Feb./Mar. 2022
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. Define and explain the various asymptotic notations with suitable example. **(10 Marks)**

b. With a neat diagram, explain recursive tree method to determine a good asymptotic upper bound on recurrence. "$T(n) = T\left(\frac{n}{3}\right) + T\left(\frac{2n}{3}\right) + Cn$" and verify the result by substitution method. **(10 Marks)**

OR

2 a. Define aggregate analysis and apply the aggregate analysis on incrementing a binary counter. **(09 Marks)**

b. Discuss how Master method can be used to solve recurrences. Solve the below recurrence using master theorem

$$T(n) = 7T\left(\frac{n}{2}\right) + \theta(n^2)$$ **(06 Marks)**

c. Write a note on :
(i) Floors and Ceilings (ii) Exponentials. **(05 Marks)**

Module-2

3 a. Write and explain Djikstra's algorithm. Apply algorithm for the following graph taking 's' as source vertex. [Refer Fig.Q3(a)]. **(12 Marks)**

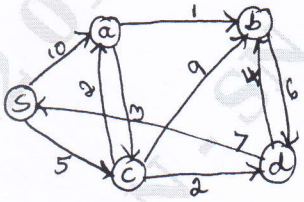

Fig.Q3(a)

b. Explain the properties of flow networks. **(08 Marks)**

OR

4 a. Write recursive FFT algorithm and obtain the running time. **(10 Marks)**

b. Write and explain Johnson algorithm for sparse graph. Use the same to find shortest paths between all pairs of vertices in the graph of Fig.Q4(b).

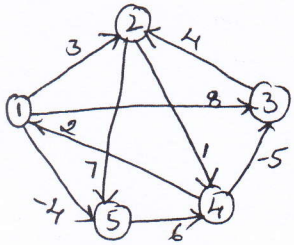

Fig.Q4(b) **(10 Marks)**

Module-3

5 a. Write extended form of Euclid's algorithm to compute GCD of two numbers. Compute the value (d, x, y) that call extended-euclid(99, 78) returns and prove that $d = gcd(a, b) = ax + by$ **(10 Marks)**

b. Write procedure to create public and secret keys in RSA public key cryptosystem. **(05 Marks)**

c. Explain Pollard-Rho method to find factors of small numbers. **(05 Marks)**

OR

6 a. Write and explain Miller-Robin primality testing. **(08 Marks)**

b. Explain finite groups and its properties in detail. **(07 Marks)**

c. Write and explain the Chinese Remainder Theorem. **(05 Marks)**

Module-4

7 a. With an algorithm, explain the working procedure of Rabin –Karp for string matching. Give its runtime efficiency. **(10 Marks)**

b. Explain finite automata-matcher algorithm and construct the string matching automation for the pattern P = ababaca and illustrate its operation on text string T = abababacaba **(10 Marks)**

OR

8 a. Explain Boyer-Moore algorithm for string matching and trace algorithm for the following text and pattern

Text : BESS_KNEW_ABOUT_BAOBABS

Pattern : BAOBAB **(10 Marks)**

b. Explain Knuth Morris – Pratt algorithm. Give its run-time efficiency. **(10 Marks)**

Module-5

9 a. Write and explain an algorithm for polynomial equality testing, using Monte - Carlo method. **(10 Marks)**

b. Briefly explain Las Vegas algorithm. **(10 Marks)**

OR

10 a. Explain randomizing deterministic algorithm taking linear search algorithm as example. **(10 Marks)**

b. How to implement the dart-throwing technique using Monte - Carlo integration algorithm? Explain. **(10 Marks)**

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