



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

First Semester, M. Tech - Computer Engineering

Make – up Examination; Feb - 2016

Advanced Algorithms

Time: 3 hrs

Max. Marks: 100

Note: Answer **FIVE** full questions, selecting **ONE** full question from each unit.

UNIT - I

1 a. Solve the following recurrence using Master’s theorem,

(i) $T(n) = 7T\left(\frac{n}{2}\right) + 18n^2$

8

(ii) $T(n) = 9T\left(\frac{n}{3}\right) + 4n^6$

b. What is the time complexity of an algorithm which uses the divide and conquer strategy? Show that the solution of $T(n) = 2T\left(\frac{n}{2}\right) + n$ is $O(n \cdot \log n)$ using substitution method.

12

2 a. Explain the basic asymptotic notations with example.

10

b. Draw the recursion tree for $T(n) = 4T\left(\left\lfloor \frac{n}{2} \right\rfloor\right) + cn$ where ‘c’ is a constant and provide a tight asymptotic bound on its solutions.

10

UNIT - II

3 a. Write an algorithms for longest common subsequences and show the operations for the same for the recurrence,

$\langle e, n, q, u, i, r, i, n, g \rangle$

10

$\langle s, e, s, q, u, i, p, e, d, a, l, i, a, n \rangle$

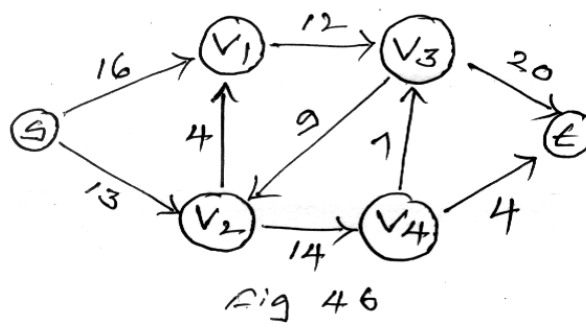
b. With any example explain maximum Bi-partite matching problems.

10

4 a. Write an algorithm for matrix-chain multiplications and show the operations for the same for the matrices $A_1(5 \times 4)$, $A_2(4 \times 6)$, $A_3(6 \times 2)$ and $A_4(2 \times 7)$.

10

b. Write any algorithms for Ford-Fulkerson and show the executions for the following graph. Fig 4b.



10

UNIT - III

- 5 a. Explain a model of multithreaded. Execution for the computation of Fibonacci numbers. 8
- b. Briefly review the division theorem, modular equivalence and relatively. Prime integers of Elementary number theoretic Notations. 6
- c. Write Algorithm to solve the equations $aX \equiv 6 \pmod{m}$ Find the solution for the equation $14X \equiv 30 \pmod{100}$ 6
- 6 a. Write algorithm to find GCD by using Euclid and extended Euclid algorithm. 10
 Compute GCD (99, 78) using EE algorithm, showing computation step at each level.
- b. Write pollard rho algorithm for $n = 1387$. Find prime factors using this algorithm. 10

UNIT - IV

- 7 a. With any example explain KMP algorithm for string matching and compute its prefix functions. 10
- b. Prove that SAT of Boolean formula in 3 CNF is NP - complete. 10
- 8 a. Describe Boyer-Moore string matching algorithm with example. 10
- b. Draw the Hamilton cycle reduction graph for the Min-vertex cover. Problem of the following graph (Fig. 8b) they comment the TSP encoding, edges etc. What becomes apparent from this?

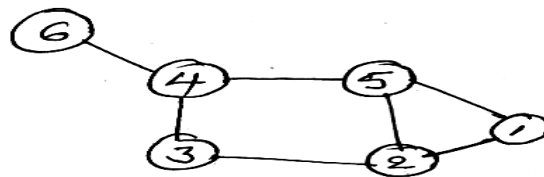


Fig 8b .

UNIT - V

- 9 a. Compare Monte-Carlo and Las-Vegas algorithm and give how Las-Vegas algorithm is different. 10
- b. It is required to sort the following eight numbers in the ascending order using bubble sort. Suggest a parallel bubble sort solutions and arrange the number in order. 10
 40, 70, 30, 20, 10, 60, 50, 90.
- 10 a. Arrange the following elements in the ascending order using QUICKSORT by randomly selecting pivot elements in the array and subsequent sub arrays show each step in solution. 10
 30, 55, 12, 21, 45, 09, 29, 82.
- b. List and explain at least four major constraints to be taken care of while designing a parallel algorithm. 10

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