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Second Semester M.Tech. Degree Examination, June/July 2013
Advanced Algorithms

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

- 1**
- Define the asymptotic notations O , θ , Ω . (03 Marks)
 - Using the master method, solve the following recurrences:
 - $T(n) = 8T\left(\frac{n}{2}\right) + \theta(n^2)$
 - $T(n) = T\left(\frac{2n}{3}\right) + 1$
 - $T(n) = 3T\left(\frac{n}{4}\right) + n \lg n$ (09 Marks)
 - Draw a recursion tree for the recurrence, $T(n) = 3T\left(\frac{n}{4}\right) + Cn^2$ and indicate the running time for the same. (08 Marks)
- 2**
- Write Bellman-Ford algorithm for solving single-source shortest-paths problem, also indicate the running time of the same. (06 Marks)
 - Compute all-pairs shortest-paths for the following directed graph using Johnson's algorithm. (14 Marks)

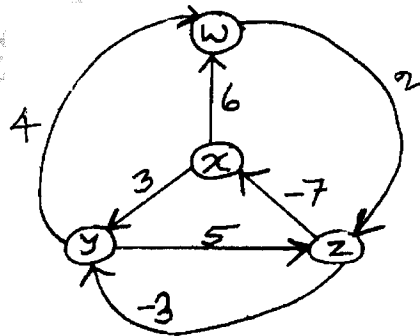


Fig. Q2 (b)

- 3**
- Write and explain recursive Fast Fourier Transform (FFT) procedure for evaluating a polynomial. (08 Marks)
 - Write the Euclid's and extended Euclid's algorithm for computing gcd. Compute gcd (99,78) using the extended Euclid's algorithm, showing the computation steps at each level of recursion. (12 Marks)
- 4**
- Apply Chinese remainder theorem to compute solution to the equations,

$$a \equiv 2 \pmod{5}$$

$$a \equiv 3 \pmod{13}$$
 (10 Marks)
 - Write and describe the procedure followed to create public and secret keys in RSA public-key cryptosystem. (10 Marks)

- 5 a. Write the naive string-matching algorithm. Show the operation of the same, for the pattern $P = aab$ and the text $T = acaabc$. Also indicate the worst-case running time. (10 Marks)
- b. Explain string matching with finite automata. Write state-transition diagram and transition function δ , for the string-matching automation that accepts all strings ending in the string $ababaca$. (10 Marks)
- 6 a. 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. Compute the prefix function π for the pattern $ababbabbabbabbabb$ in the alphabet $\Sigma \{a, b\}$ for Knuth-Morris-Pratt algorithm. (10 Marks)
- 7 a. Explain randomizing deterministic algorithms taking linear search algorithm as an example. (10 Marks)
- b. Explain Monte Carlo and Las Vegas algorithms with appropriate examples. (10 Marks)
- 8 Write short notes on the following:
- a. Potential method.
- b. Ford Fulkerson method.
- c. Maximum bipartite matching.
- d. Representation of polynomials. (20 Marks)

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