KUMARAGURU college of technology
character is life

Register Number:……

M.E DEGREE EXAMINATIONS: JAN 2015

(Regulation 2014)

First Semester

COMPUTER SCIENCE AND ENGINEERING

P14CST101: Advanced Data Structures and Algorithms

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Which method provides bounds for recurrences of the form T(n) = aT(n/b) +f(n) [K_1]

   a) Substitution method b) Recursion-tree method

   c) Divide and conquer method d) Master method

2. Big-Oh , Big Θ and Big – Omega gives an asymptotic [K_2]

   a) Upper, equivalence and lower bound b) Upper, little and lower bound

   c) Upper, lower and equivalence bound d) Equivalence, upper and lower bound

3. T(n) = T(ceil(n/2))+1 is equivalent to [K_2]

   a) O(n) b) $O(\log_2 n)$

   c) O(n log n) d) $O(\log_{10} n)$

4. Match the following [K_2]

   (i) Divide & conquer a. Matrix chain multiplication

   (ii) Greedy b. Linear search

   (iii) Dynamic programming c. Merge sort

   (iv) Brute force d. Job scheduling

   a) (i) - c, (ii) - d, (iii) - a, (iv) - b b) (i) - d, (ii) - a, (iii) - b, (iv) - c

   c) (i) - b, (ii) - a, (iii) - c, (iv) - d d) (i) - a, (ii) - d, (iii) - b, (iv) - c

5. Arrange the following time complexities in their ascending order of growth [K_3]

   (i) $O(n^2)$ (ii) O(n log n) (iii) O (log n) (iv) O(n)

   a) iii, ii, iv, i b) iii, iv, ii, i

   c) ii, iii, iv, i d) i, ii, iii, iv

6. Trie structure is used for [K_2]

   a) Searching in hard disk b) Process selection

   c) Process scheduling d) Indexing

7. Find the root element in the max heap and min heap formed from the array: [K_3]

3,56,78,23,54,79,98

a) 98,3 b) 3,78

c) 3,98 d) 56,98

8. (i) Dynamic programming needs extra memory space [K_1]

(ii) Greedy always gives optimal solution

Which of the following is correct for the above two statements

a) True, True b) False, True

c) False, False d) True, False

9. Matrix multiplication time complexity is [K_2]

a) $O(n^2)$ b) $O(n^{2+1})$

c) $O(n^3)$ d) $O(1+n^2)$

10. The time complexity of insertion in b-heaps is [K_1]

a) O(1) b) O(n)

c) Log(n) d) $O(n^2)$

PART B (10 x 2 = 20 Marks)

11. Define big oh notation. Give any two properties of it. [K_1]

12. Show how F-heaps are used in the shortest path algorithm. [K_2]

13. Sort an array with the items: 3,6,8,4,1,32,12,67 and 34. Show that the sorted array forms a heap. Which heap is formed? [K_3]

14. Draw the trie obtained for the following: [K_2]

Amar, Avenue, Book, cat, hello, hen, march, mars, split, xray

Sample the keys from left to right one character at a time.

15. Define binomial heap. [K_1]

16. Compare divide - and - conquer and dynamic programming. [K_1]

17. Give an example for polynomial bound and exponential bound algorithms. [K_2]

18. Distinguish between Euler tour and Hamiltonian cycle. [K_2]

19. Define NP complete. [K_1]

20. When will you say the approximation scheme is a fully polynomial-time approximation scheme? [K_2]

PART C (6 x 5 = 30 Marks)

21. How will you check the given tree is leftist tree? Explain with an example [K_3]

22. With an example explain travelling salesman problem. [K_3]

23. Illustrate the difference between probabilistic analysis and randomized algorithms with example [K_2]

24. Explain with an example how the insertion is done in B tree. [K_2]

25. Wrtie a function to implement MinChildGrandChild(i) in Minmax Heap [K_3]

26. With an example explain how string matching is done using finite automata [K_3]

PART D (4 x 10 = 40 Marks)

27. Using the algorithm of finding an optimal binary search tree, compute w_{ij}, r_{ij} and c_{ij}, $0<=i<j<=4$, for the identifier set (a_1,a_2,a_3,a_4) = (else , private, return, template), with $p_1 = 1/20$, $p_2 = 1/5$, $p_3 = 1/10$, $p_4 = 1/20$, $q_0 = 1/5$, $q_1 = 1/10$, $q_2 = 1/5$. $Q_3 = 1/20$ and $q_4 = 1/20$. Using the r_{ij} 's , construct optimal binary search tree. [K_3]

28. Develop a function to implement the following: [K_3]

    Insert an element into F-heap
    Delete and return the element in node b of an F-heap
    Decrease the key in node b of an F-heap by some positive amount c

29. Take an example for designing a solution using dynamic programming and explain. [K_2]

30. Write an algorithm to create and insert an item in the AVL tree. [K_2]

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