Register Number: ……..

B.E / B.TECH DEGREE EXAMINATIONS: APRIL/MAY 2014

(Regulation 2009)

Third Semester

CSE104:DESIGN AND ANALYSIS OF ALGORITHMS

(Common to CSE & IT)

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Which of the following algorithm is an example of O(n)
   a) Initializing all the elements in a two dimensional array to zero.
   b) Incrementing all the elements in a one dimensional array
   c) Finding the sum of all the elements in the linked list.
   d) All of the above.
2. Which one of the following does not make use of stack?
   a) Function call
   b) Infix to postfix conversion
   c) Evaluating postfix expression
   d) Jobs in the printer
3. Time complexity of sequential search in average and worst case is
   a) Quadratic
   b) Linear
   c) Exponential
   d) Cubic
4. The following is the position of the substring ‘ever’ in the string ‘everest is forever’
   a) 0
   b) 0 & 15
   c) 13
   d) 15
5. Which of the following algorithm is an example for variable-size decrease and conquer method?
   a) Binary-search
   b) Gcd
   c) Bubble sort
   d) Selection sort
6. Which sorting algorithm requires extra space?
   a) Quick sort
   b) Insertion sort
   c) Merge sort
   d) Selection sort
7. The time efficiency of heap sort is
   a) O(logn)
   b) O(n)
   c) O(nlogn)
   d) $O(n^2)$
8. A spanning tree of a connected graph is the connected acyclic subgraph that contains,
   a) A few vertices of the graph
   b) All the vertices of the graph
   c) First & last vertices of the graph
   d) Options (a) (b) & (c)
9. A node in a state space tree corresponds to a node that still lead to a complete solution, is Known as
   a) promising node
   b) non-promising node
   c) child node
   d) root node
10. A cycle that passes through all the vertices of the graph exactly once is a,
    a) Knapsack problem
    b) Hamiltonian circuit problem
    c) Subset- sum problem
    d) all options a, b &c

PART B (10 x 2 = 20 Marks)

11. Show the contents after each operation of the following sequence
    a. push(a),push(b),pop, push(c), push(d), pop
    b. Enqueue(a), enqueue(b), dequeue, enqueue(c), enqueue(d), dequeue
12. From the following equalities, indicate the ones that are incorrect
    a.$6n^2-8n = \theta(n^2)$
    b. $12n^2+8=O(n)$
    c.$3n^23^n+n\log n = \theta (n^23^n)$
    d.$3n^2\log n = \theta (n^2)$
13. Solve the following recurrence relations.
    $X(n) = x(n/2) + n$ for $n>1$, $x(1) = 1$
14. Compare the orders of growth of $\frac{1}{2}n(n-1)$ and n^2
15. Find the number of character comparisons that will be made by Brute Force String Matching for the pattern ABABC in the following text:
    BAABABABCCA
16. Sequential search can be used with about the same efficiency whether a list is implemented as an array or as a linked list. Is it also true for binary search? Give your reason.
17. Construct a heap for the list 1,8,6,5,3,7,4 by successive key insertions
18. Define the transitive closure of a directed graph with n vertices.
19. What is meant by Hamiltonian Circuit problem
20. Consider the following instance of the knapsack problem: n=3, m= 20, (p1,p2,p3) = (25,24,15) and (w1,w2,w3) = (18,15,10). Find all feasible solutions.

PART C (5 x 14 = 70 Marks)

21. a) (i) Explain Orders of growth of algorithm. Also explain worst-case, best-case and average-case efficiencies with example. (7)

(ii) Explain in detail about the important problem types. (7)

(OR)

b) (i) Prove that (7)

if $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$, then $t_1(n) + t_2(n) \in O(\max\{g1(n),g2(n)\})$.

(ii) Explain in detail about basic efficiency classes with examples. (7)

22. a) Do the mathematical analysis for finding the n^{th} Fibonacci numbers

(OR)

b) (i) Do the mathematical analysis for any two non recursive algorithms. (7)

(ii) You have a row of binary digits arranged randomly. Arrange them in such an order that all o's precede all 1s or vice-versa. The only constraint in arranging them is that you are allowed to interchange the positions of binary digit if they are not similar. (7)

1 1 0 1 0 1 0 0 --------→ 0 0 0 0 1 1 1 1

Design an algorithm for solving this problem and analyze its worst case time complexity

23. a) (i) What is the largest number of key comparisons made by binary search in searching for a key in the following array? Also list all the keys of this array that will require the largest number of key comparisons when the search is made by binary search. (7)

10,12,5,9,4,11,8,3,13,2,7,1,6

(ii) With suitable example explain Depth First Search (7)

(OR)

b) With an algorithm illustrate the operation of merge sort on the array A={3,41,52,26,38,57,9,49} and analyze its time complexity.

24. a) (i) a. Construct a Huffman tree for the following data and obtain its Huffman code. (7)

Character	A	B	C	D	--
Probability	0.35	0.1	0.2	0.2	0.15

b. Encode the text DAD_B using the code of question (a).

c. Decode the text whose encoding is 10011011011101 in the code of question (a).

(ii) Explain the Kruskal's algorithm with suitable example (7)

(OR)

b) Explain optimal binary search trees with example. Write the pseudocode for the same.

25. a) Explain the following

1) Hamiltonian circuit problem (7)

2) Subset-sum problem (7)

(OR)

b) Explain the following

1) Knapsack problem (7)

2) Traveling salesman problem (7)

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