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Register Number: …….

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2013)

Fourth Semester

COMPUTER SCIENCE AND ENGINEERING

U13CST401: Design and Analysis of Algorithms

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Sequence the following in the increasing order of time complexity:
   1. N log n
   2. N^2
   3. Log n
   4. 2^n

   a) 4,3,2,1 b) 1,2,4,3

   c) 3,1,2,4 d) 1,3,2,4

2. The time complexity of the following program segment is_____.

```
for(i = n;  i>1;  i = i/2)
{
   printf("KCT")
}
```

3. Match the following:

A. Matrix Multiplication	1. T(n) = T(n-1) + 10
B. Merge sort worst case	2. O(n^2)
C. Recurrence relation	3. T(n) = T(n/2) +1
D. Divide and conquer	4. O(n log n)

   a) A-4, B-2, C – 1, D-3 b) A-2, B-4, C – 3, D-1

   c) A-2, B- 3, C – 1, D-4 d) A-2, B-4, C – 1, D-3

4. The average case efficiency of Brute force string matching algorithm is ----------

5. Find the time complexity of the following recursive algorithm:

```
Test(A[1..n], B[1..n], C[1..n])
        if n= 0 then return;
        For i :=  1 to n do
           C[1] := A[1] * B[i];
        call Test(A[2..n], B[2..n], C[2..n]);
```

a) n^2 b) log(n)

c) n log(n) d) n

6. _____algorithm is used to find Transitive closure of an undirected graph.
7. Which one of the following is asymptotic lower bound?

a) Big O b) Omega

c) Theta d) Small o

8. The best value of the objective function is called _____.
9. Match the following:

A. Table filling	1.Huffman Code
B. Compression Ratio	2. Divide and conquer
C. 8 - Queen	3. Dynamic Programming
D. Binary search	4. Back Tracking

a) A-3, B -1, C-2, D-4 b) A-3, B -1, C-4, D-2

c) A-3, B -2, C-4, D -1 d) A-4, B -1, C-2,D -3

10. The maximum number of binary search trees that can be constructed with modes A, B and C is_____.

PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

11. Write an algorithm with the time complexity of O(n^3)
12. Define Big O notation.
13. Solve the recurrence relation x(n) = x(n-1) + 10 for n>1, x(1) =0.
14. Consider the following recursive algorithm:

```
Q(n)
If n=1 return 1
else return Q(n-1) + 2* ( n-1)
```

Find the recurrence relation for the function values and find the functionality of this function

15. What do we do in divide and conquer technique? State the special features of this technique
16. State the available variations in decrease and conquer technique

17. Distinguish Between Divide and Conquer Technique and dynamic programming.
18. What are different solutions achieved by all design techniques?
19. Generate all permutations of (1,2,3) by backtracking.
20. What are the extra items needed for Branch and bound compared to back tracking?

PART C (5 x 14 = 70 Marks)

(Not more than 400 words)

Q.No. 21 is Compulsory

21. a) (i) Write all pairs shortest path algorithm to find the shortest path. Trace the graph with the following adjacency matrix (with weight). If no edge exists between the nodes, then the weight is ∞. (10)

	Node 0	Node 1	Node 2	Node 3	Node 4	Node 5
Node 0	∞	5	∞	20	40	∞
Node 1	∞	∞	10	15	∞	∞
Node 2	∞	∞	∞	90	∞	∞
Node 3	∞	∞	∞	∞	50	∞
Node 4	∞	∞	∞	∞	∞	35
Node 5	∞	∞	25	30	∞	∞

(ii) Write a note on N – Queen's problem. How back tracking technique is applied to find the solution? (4)

22. a) (i) Explain any two recursive algorithms and analyze the time efficiency. (10)

(ii) Explain any two important problem types. (4)

(OR)

b) (i) Explain the analysis frame work with appropriate example (8)

(ii) Write a note on Algorithm visualization. (6)

23. a) (i) Apply Brute force method to find the string matching. (7)

(ii) Define decrease and conquer technique. Explain any one algorithm with an example. Analyze the time complexity. (7)

(OR)

b) Consider an ant in an N*N maze in which some cells are marked 'prohibited', i.e., the ant can't enter these cells. If the ant starts from the top-left cell and needs to go to the bottom -right cell, then give an asymptotically

optimal algorithm for the ant to identify the shortest path, assuming that such a path exists. Assume that the ant can move in one of the four directions: Up, Down, Left and Right. Apply an appropriate design technique.

24. a) Apply dynamic programming to the following instance of Knapsack Problem. Find the optimal solution for the given problem. Knapsack Capacity W=6

Item	Weight	Value
1	3	$25
2	2	$20
3	1	$15
4	4	$40
5	5	$50

(OR)

b) Explain the Huffman's Algorithm. Construct the Huffman's tree for the following data and obtain its Huffman's Code Character.

Character	A	B	C	D	-
Probability	0.4	0.1	0.2	0.15	0.15

i. Encode the text ABACCABBD using the above question.

ii. Decode the text whose encoding is 1001010110 in the code of question

25. a) Explain backtracking technique. Apply this technique to the following instance of the subset-sum problem: S = {1, 2, 3,4, 6,7} and d=10.

(OR)

b) Explain assignment problem and Find the optimal solution for the assignment problem given below.

	JOB1	JOB2	JOB3	JOB4
PERSON a	6	7	8	6
PERSON b	10	7	2	4
PERSON c	12	9	6	1
PERSON d	2	6	5	10

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