Total No. of printed pages = 7

CS 131604

13/06/18

Roll No. of candidate | | | | | | | | | | |

2018

B.Tech. 6th Semester End-Term Examination

DESIGN AND ANALYSIS OF ALGORITHM

Full Marks – 100 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *six from* the rest : (10 × 1 = 10)

1. Answer the following.

   (a) An abstraction of a real world computer is called ————————

   (b) ———————— solution requires reasoning built on knowledge and experience.

   (c) In ———————— all children of the e-node are generated before any other live node becomes e-node.

   (d) Algorithm that runs constant no. of steps for ally input size is of ———————— complexity.

   (e) The direct, intuitive and straight- forward technique of solving problems is ————————

(f) Back tracking is used for solving ———— problems.

(g) A top down approach of storing intermediate values so that re-computation is avoided, is called ————

(h) A problem of assigning tasks to workers such that the work effort is minimized is ————

(i) The branch of computer that deals with heuristic types of problem is called ————

(j) Decision version of a problem is ———— than Optimization version of the problem.

2. (a) Arrange the following function growth in descending order: (3)

(i) $O(n^c)$ where c is $0 < c < 1$

(ii) $O(\lg n)$

(iii) $O(n \lg n)$

(iv) $O(n^k)$ where $k \geq 1$

(v) $O(c^n)$ where $c > 1$

(vi) $O(\lg \lg n)$

(vii) $O(n!)$

(viii) $O(1)$.

(b) Find the asymptotic rate for the following expressions: (4)

(i) $l g n!$

(ii) $\sum_{i=1}^{n} 1/n$

(iii) $1^k + 2^k + 3^k + \ldots + n^k$

(iv) $1 + 2 + 4 + 8 + \ldots + 2^k$.

(c) What do you mean by running time of an algorithm? Give an example by finding running time of an algorithm. (5)

(d) Differentiate between worst case and best case analysis of any algorithm. (3)

3. (a) Define Asymptotic classes of function. Explain all the known Asymptotic classes. (6)

(b) Use Master's Theorem to find complexities of the following Recurrence relations: (5)

(i) $T(n) = 4T(n/2) + n^2$

(ii) $T(n) = 2^n T(n/2) + n^n$

(iii) $T(n) = 2^{1/2} T(n/2) + \log n$

(iv) $T(n) = 2T(n/4) + n^{0.51}$

(v) $T(n) = 0.5T(n/2) + 1/n$.

(c) What is space complexity of an algorithm ? And derive the space complexity and Time Complexity of the following recursive function. (4)

```
A(n)
 {
   if (n>=1)
   {
     A(n-1);
     print f ("0/0d" , n);
     A (n-1);
   }
 }.
```

4. (a) Illustrate a bruteforce approach for Sorting Algorithm. (5)

(b) Explain the 4 queen problem with example. (5)

(c) Complete Huffman coding for the set of symbols shown in the following table along with the frequency: (5)

Character	Frequency
a	5
b	9
c	12
d	13
e	16
f	45

5. (a) Consider the following table that consists of workers A,B,C.D with corresponding cost of time by each worker on their ability to finish job1, job2, job3, job4 respectively. Solve the job assignment problem using Branch and Bound: (5)

	Job 1	Job 2	Job 3	Job 4
A	9	2	7	8
B	6	4	3	7
C	5	8	1	8
D	7	6	9	4

(b) Consider the following table that consists of some items with weight and cost values. If knapsack capacity is 60kg, find the feasible solution using fractional knapsack: (5)

Items	Weight	Value
I_1	5	30
I_2	10	40
I_3	15	45
I_4	22	77
I_5	25	90

(c) Find the longest common subsequence between two patterns "MYCYZ" arid "YDCMYZ" using Backtracking method. (5)

6. (a) Find the shortest path from source to each vertices of the following directed graph using dijkstra's algorithm. (5)

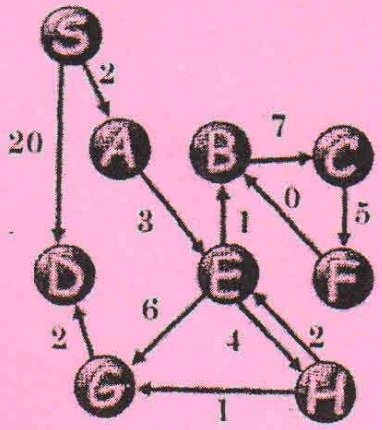

Figure for Q 15 (a)

Figure 1: Graph V,E with V= 9 vertices, E = 12 edges with respective weights.

(b) Find the Depth First Search of the following graph. (5)

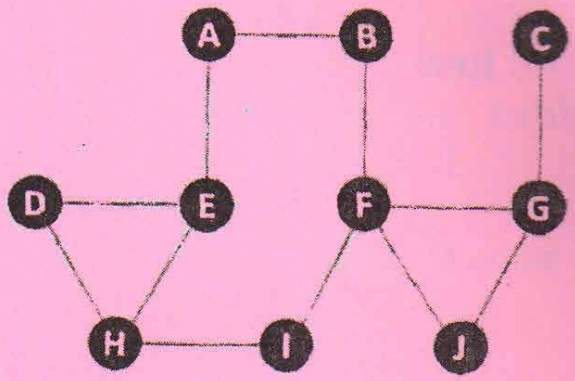

Figure for Q. 15 (b)

Figure 2 : Graph V, E with V = 10 vertices, E = 12 edges.

(c) Find the Minimum spanning Tree of the following graph using a Greedy Approach. (5)

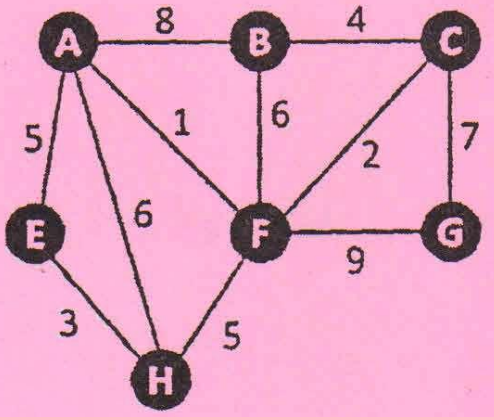

Figure for Q. 15 (c)

Figure 3: Graph V,E,W with V= 7 vertices, E = 11 edges with respective weights W.

7. (a) Give the classification of problems in Computer Science. Explain about each classified problem. (4)

(b) Give the difference between Optimization Problem and Decision Problem. (3)

(c) Give the Difference between Deterministic and Non-Deterministic machines. (3)

(d) Define Computability classes P and NP. And justify their Relationship. (5)

8. (a) What are NP Hard and NP Complete problems. Give their relationship. (3)

(b) Prove Cooks Theorem. (6)

(c) Prove that vertex cover problem is NP complete. (6)

9. (a) Explain an Approximation algorithm of any problem and compare it with its optimized algorithm in terms of complexity factors. (8)

(b) What are Co-NP and PSPACE problems? (4)

(c) What is a randomized algorithm? (3)
