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∞	7	3	12	8
3	∞	6	14	9
5	8	∞	6	18
9	3	5	∞	11
18	14	9	8	∞

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Total No. of Questions: 6 *Total No. of Printed Pages:4*

Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2018

CS3CO13/IT3CO06 Design and Analysis of Algorithms

Programme: B.Tech. Branch/Specialisation: CSE/IT

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. If algorithm A has running time 7n^2+3n+9 and algorithm B has running time 2n^2 then, **1**

(a) Both have same asymptotic time complexity
(b) A is asymptotically greater
(c) B is asymptotically greater
(d) None of these

ii. Complexity of the recurrence relation T(n)=3T(n/3)+n^2 **1**

(a) Θ (n log n) (b) Θ (log n) (c) Θ (n^2) (d) Θ (n^3)

iii. Average case complexity of binary search is **1**

(a) Θ (n^2) (b) Θ (n/2) (c) Θ (1) (d) Θ (log n)

iv. When the given inputs are already sorted, which sorting technique gives worst performance. **1**

(a) Merge Sort (b) Quick Sort
(c) Heap Sort (d) None of these

v. Which of the following is true about Huffman Coding **1**

(a) Huffman Coding may become lossy in some cases
(b) Huffman Codes may not be optimal lossless codes in some cases
(c) In Huffman coding, no code is prefix of any other code
(d) All of these

vi. Number of Spanning tree of a complete graph with n vertices are **1**

(a) n^{n-1} (b) nC(n-1) (c) n^{n-2} (d) None of these

vii. If an optimal solution can be created for a problem by constructing optimal solutions for its subproblems, the problem possesses _____ property. **1**
(a) Overlapping subproblems (b) Optimal substructure
(c) Memorization (d) Greedy

viii. When a top-down approach of dynamic programming is applied to a problem, it usually _____
(a) Decreases both, the time complexity and the space complexity
(b) Decreases the time complexity and increases the space complexity
(c) Increases the time complexity and decreases the space complexity
(d) Increases both, the time complexity and the space complexity

ix. Which of the following is not a backtracking algorithm? **1**
(a) Knight tour problem (b) N queen problem
(c) Tower of Hanoi (d) M coloring problem

x. What is the minimum colour required to color a cube's vertices **1**
(a) 4 (b) 3 (c) 2 (d) 6

Q.2 i. (a) Differentiate between Recursive and Iterative Algorithm. **4**
(b) Explain formula of Master's Method for solving recursive algorithm.

ii. Sort these elements using Insertion Sort in ascending order. **6**
75, 65, 45, 47, 94, 85, 77, 62, 87
How many number of shifting is required to sort the above elements.

OR iii. Solve these Recurrence Relation **6**
(a) $T(n)= 3T(n/3) + \Theta(n)$
(b) $T(n)= T(n-1) + 5n$
(c) $T(n)= 8T(n/4) + \Theta(n \log n)$

Q.3 i. What is Stable Sort? Name any two Stable Sorting Algorithm **3**

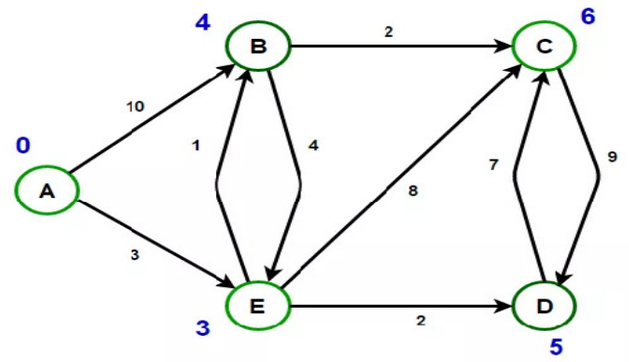
ii. What is Divide & Conquer Strategy. Write Binary Search Algorithm. Analyse complexity of algorithm in best and worst case. **7**

OR iii. Sort these elements using Heap sort (Max Heap) **7**
98, 77, 55, 80, 99, 64, 91, 22, 83, 44, 65, 86, 90

Q.4 i. What is basic difference between Prim's and Kruskal's Algorithm **2**

ii. Find Optimal Merge Pattern for 7 files whose length are 12, 9,3,11,15,20,13 **3**

iii. Find the single source shortest path with vertex 'A' as the source **5**



OR iv. Construct the Huffman Code for the following data. **5**

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

Decode the text whose ending 100010111001010 using the above Huffman Code.

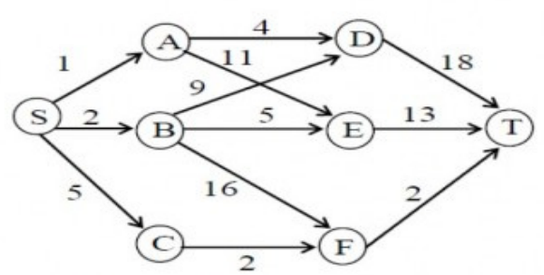
Q.5 i. Solve the following instances of 0/1 Knapsack Problem using Dynamic Programming **4**

Item	1	2	3	4
Weight	4	7	5	3
Value	40	42	25	12

The Capacity of Knapsack W is 10.

ii. Explain how a reliability design can be obtained using Dynamic Programming. **6**

OR iii. Consider Multistage Graph G **6**



Find the Cost from shortest path from S to T using Multistage graph method?

Marking Scheme

CS3CO13/IT3CO06 Design and Analysis of Algorithms

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(a) Both have same asymptotic time complexity

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(c) Θ (n^2)

iii. Average case complexity of binary search is **1**
(d) Θ (log n)

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ix. Which of the following is not a backtracking algorithm? **1**
(c) Tower of Hanoi

x. What is the minimum colour required to color a cube's vertices. **1**
(c) 2

Q.2 i. Differentiate between Recursive and Iterative Algorithm. **4**
2 differences 2 marks
Formula of Master's Method for solving recursive algorithm. 2 marks

ii. Sort these elements using Insertion Sort in ascending order. **6**
75, 65, 45, 47, 94, 85, 77, 62,87
Sorting Passwise 4 marks
Number of shifting is required to sort the above elements. . 2 marks

OR iii. Solve these Recurrence Relation **6**
(a) T(n)= 3T(n/3)+ Θ (n) 2 marks
(b) T(n)= T(n1)+ 5n 2 marks
(c) T(n)= 8T(n/4)+ Θ (n log n) . 2 marks

Q.3 i. What is Stable Sort ? **3**
Definition 2 marks
Name any two Stable Sorting Algorithm
Names 1 mark

ii. What is Divide & Conquer Strategy. 2 marks **7**
Write Binary Search Algorithm. 3 marks
Analyse complexity of algorithm in best and worst case. 2 marks

OR iii. Sort these elements using Heap sort (Max Heap) **7**
98,77,55,80,99,64,91,22,83,44,65,86,90
Stepwise

Q.4 i. What is basic difference between Prims and Krukal Algorithm **2**
2 differences 2 marks

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Stepwise 2 marks

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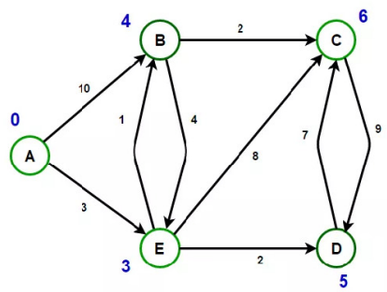

Till 2 steps Relaxation Formula 5 marks

OR iv. Construct the Huffman Code for the following data. **5**

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

Tree 3 marks

Decode the text whose ending 100010111001010 using the above Huffman Code.

Decoding 2 marks

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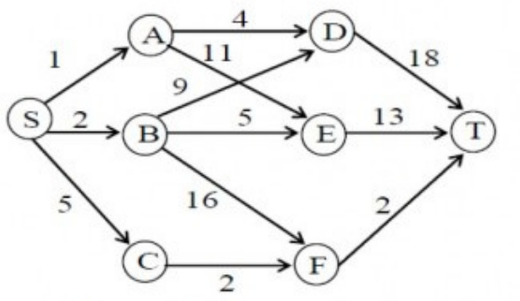
Full Solution 4 marks

ii. Explain how a reliability design can be obtained using Dynamic Progrmming. **6**

Algorithm or complete definition 4 marks

Example 2 marks

OR iii. Consider Multistage Graph G **6**



Find the Cost from shortest path from S to T using Multistage graph method?

At least till 2 steps formula 6 marks

If direct solution then 4 marks

Q.6 i. Define Hamiltonian Cycle with the Example **3**

Definition 2 marks

Example 1 marks

i. What is backtracking? Find a solution to the 4 queens Problem using Backtracking Strategy. **7**

Definition 2 marks

Solution 5 marks

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Definition 2 marks

Solution 5 marks

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