Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 91398

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Third/Fourth Semester

Computer Science and Engineering

CS 6402 – DESIGN AND ANALYSIS OF ALGORITHMS

(Common to Information Technology)

(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. The (log n)th smallest number of n unsorted numbers can be determined in O(n) average-case time (True/False).
2. Write the recursive Fibonacci algorithm and its recurrence relation.
3. Design a brute-force algorithm for computing the value of a polynomial $p(x) = a_n x^n + a_{n-1} x^{n-1} + \Lambda + a_1 x \Lambda a_0$ at a given point x_0 and determine its worst-case efficiency class.
4. Derive the complexity of Binary Search algorithm.
5. Define the Single Source Shortest Paths Problem.
6. State the assignment problem.
7. What do you mean by 'perfect matching' in bipartite graphs ?
8. State Planar coloring graph problem.
9. Write the formula for decision tree for searching a sorted array.
10. State the reason for terminating search path at the current node in branch and bound algorithm.

PART – B (5×13=65 Marks)

11. a) If you have to solve the searching problem for a list of n numbers, how can you take advantage of the fact that the list is known to be sorted ? Give separate answers for

i) Lists represented as arrays. (4)

ii) Lists represented as linked lists. (4)

Compare the time complexities involved in the analysis of both the algorithms. (5)

(OR)

b) i) Derive the worst case analysis of Merge Sort using suitable illustrations. (6)

ii) Derive a loose bound on the following equation : (7)

$f(x) = 35x^8 - 22x^7 + 14x^5 - 2x^4 - 4x^2 + x - 15.$

12. a) State and explain the Merge Sort algorithm and give the recurrence relation and efficiency. (13)

(OR)

b) Explain the method used for performing multiplication of two large integers. Explain how Divide Conquer method can be used to solve the same. (13)

13. a) i) The binary string below is the title of a song encoded using Huffman codes.

00110001011111011001110111011000001001110100101 01.

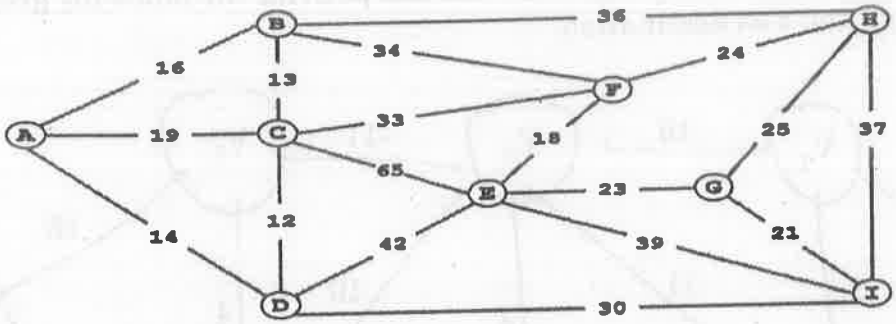
Give the letter frequencies listed in the table below, build the Huffman codes and use them to decode the title. In cases where there are multiple "greedy" choices, the codes are assembled by combining the first letters (or groups of letters) from left to right, in the order given in the table. Also, the codes are assigned by labeling the left and right branches of the prefix/code tree with '0' and '1', respectively. (7)

Letter	a	h	v	w	' '	e	t	l	o
Frequency	1	1	1	1	2	2	2	3	3

ii) Write the procedure to compute Huffman code. (6)

(OR)

b) Consider the following weighted graph. **(13)**



Give the list of edges in the MST in the order that Prim's algorithm inserts them. Start Prim's algorithm from vertex A.

14. a) Describe in detail the simplex algorithm methods.

(OR)

b) Explain KMP string matching algorithm for finding a pattern on a text and analyze the algorithm.

15. a) i) Draw a decision tree and find the number of key comparisons in the worst and average cases for the three-element bubble sort. **(7)**

ii) Write backtracking algorithm for 4-Queen's problem and discuss the possible solution. **(6)**

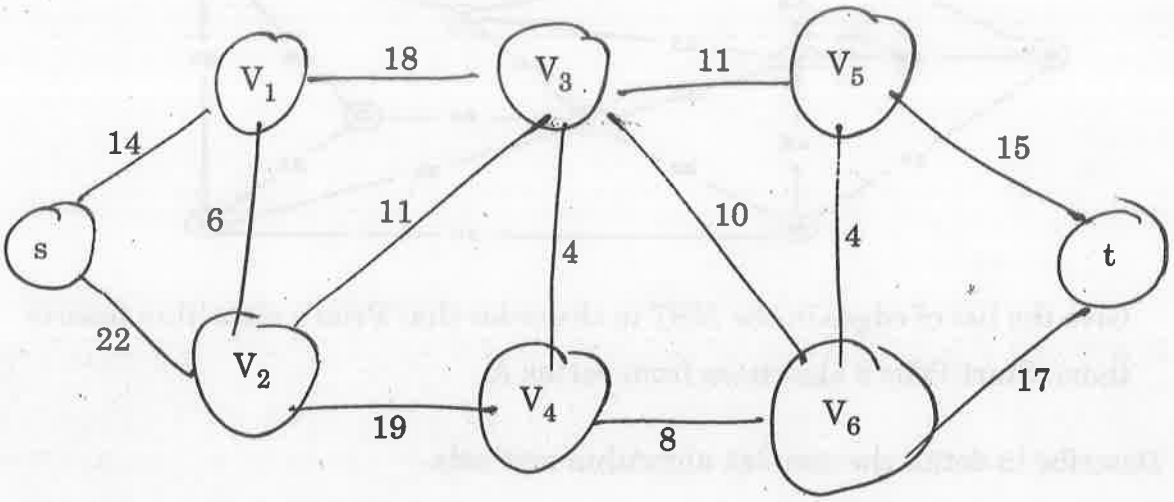
(OR)

b) Solve the following instance of Knapsack problem by branch and bound algorithm. **(13)**

Item	Weight	Profit	
1	5	$40	
2	7	$35	
3	2	$18	**W = 15**
4	4	$4	
5	5	$10	
6	1	$2	

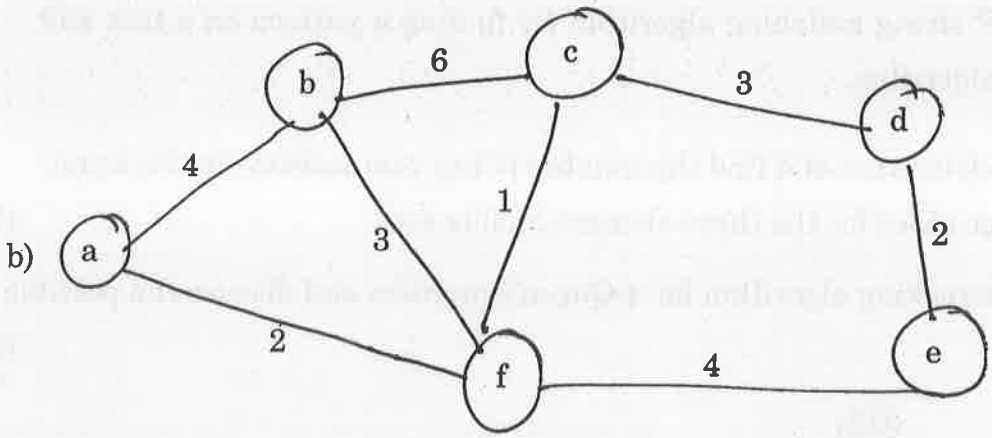
PART – C (1×15=15 Marks)

16. a) Use Dijkstra's algorithm to find the shortest path for the following graph with s as source and t as destination. (15)



(OR)

b)



Apply Prim's and Kruskal's algorithm for the above graph and find the minimum spanning tree. (15)

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