IV SEMESTER B.TECH. (COMPUTER SCIENCE & ENGINEERING)
END SEMESTER EXAMINATIONS, June 2022
SUBJECT: DESIGN AND ANALYSIS OF ALGORITHMS [CSE 2252]

REVISED CREDIT SYSTEM

(11/06/2022)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** questions.
- Missing data may be suitably assumed.

Type: DES

Q1. Write the following algorithms to find GCD of any two numbers m and n.

i. Euclid's algorithm
ii. Consecutive integer checking algorithm
iii. Middle school procedure. (3)

Q2. Write selection sort algorithm to sort a list of n elements in ascending order by scanning the list to find its largest element and exchange it with the last element, putting the largest element in its final position. Then scan the list, to find the largest among the first n-1 elements and exchange it with the last but one element, putting the second largest element in its final position and then finding next largest element in first n-2 elements and putting in its final position and so on till the n^{th} largest element is in its proper position. Trace this algorithm for the list:

27, 55, 94, 18, 78, 32, 45, 56, 21 (3)

Q3. For the graph shown in Fig. Q3, starting at vertex 'A' and resolving ties by the vertex alphabetical order, traverse the graph by depth-first search and construct the corresponding depth-first search tree. Give the order in which the vertices were reached for the first time (pushed onto the traversal stack) and the order in which the vertices became dead ends (popped off the stack).

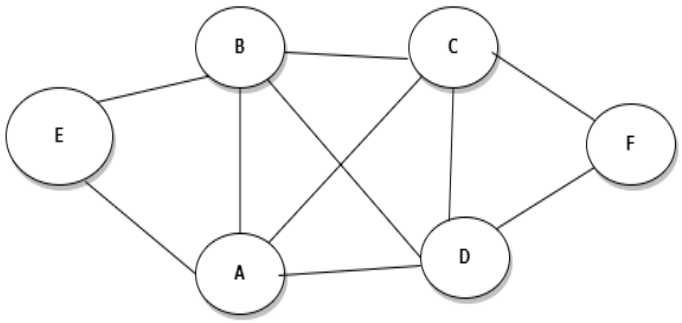

Fig. Q3. (4)

Q4. Given an array of integers, write a recursive algorithm to find the smallest element in it. Set up a recurrence relation for number of element comparisons made in this algorithm and solve it. (2)

Q5. How is insertion sort different from selection sort method? Give the pseudocode for sorting the list of numbers using insertion sort. Also, with the help of an example taking array of 5 input elements, show the tracing of best-case and worst-case input for insertion sort algorithm. (4)

Q6. For the array: **6 4 13 7 5 17 8** , show the tracing of quicksort algorithm by considering first element of the input array as the pivot. With the help of a small example, find the number of key comparisons made before partition is achieved in best-case and worst-case of quicksort algorithm. (4)

Q7. How are AVL trees better compared to normal BST? For n=1, 2, 3 and 4 draw binary trees with 'n' nodes that satisfy the balance requirement of AVL trees. Also, construct AVL tree for the given list of elements- **7, 14, 2, 5, 10, 33, 56, 30, 15, 25, 66**. Clearly show all the steps involved. (5)

Q8. Perform string matching using Boyer – Moore technique for the text: **STOU_TOR_STOR** and pattern: **STOR**. (3)

Q9. Construct 2-3 tree for the list **18, 32, 12, 23, 30, 10, 15, 20, 21, 24, 31, 40, 45, 47, 50, 52** using successive insertion method. (2)

Q10. Construct a Max Heap for the list 5**, 13, 2, 25, 7, 17, 20, 8, 4** using bottom up technique and sort this list using heap sort. Clearly show all steps of construction and sorting. (4)

Q11. Write Floyd's algorithm and apply it to find shortest path distance between every pair of vertices given in Fig.Q11.

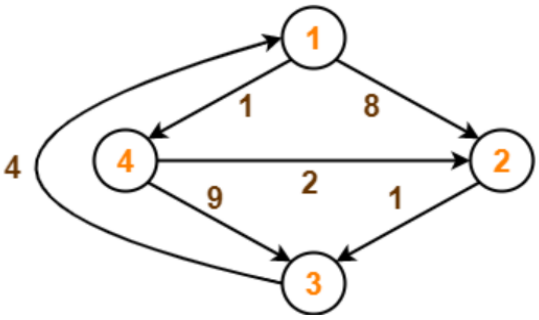

Fig. Q11 (3)

Q12. Apply the bottom-up dynamic programming algorithm to the instance of the knapsack problem given in Table 12, with capacity W = 6.

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item	weight	value
1	3	$25
2	2	$20
3	1	$15
4	4	$40
5	5	$50

Table 12.

(3)

Q13. a) Construct the Huffman tree and obtain the Huffman code for the data given in table 13

Symbol	A	D	F	I	N	T
Frequency	0.08	0.15	0.08	0.38	0.23	0.08

Table 13

b) Decode 00111100111101011101110011111000 using the code obtained in (a)

c) Compute the compression ratio (5)

Q14. Apply Dijkstra's algorithm for the graph given in Fig. 14. By considering n0 as source vertex. (3)

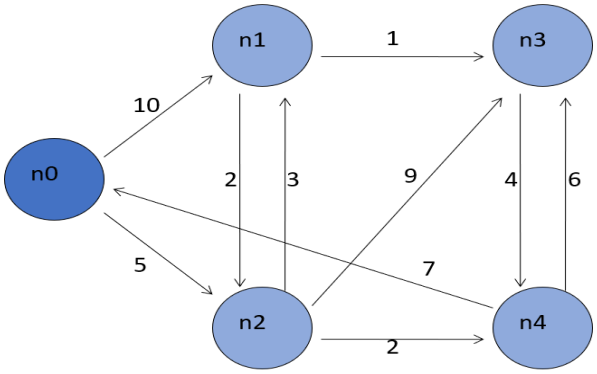

Fig. 14.

Q15. What are the choices that must be made in each step of the greedy technique? (2)

COs and Cognitive levels

Question No.	CO	Cognitive
Q1	1	1
Q2	5	3
Q3	5	3
Q4	3	3
Q5	5	4
Q6	1	3
Q7	1	4
Q8	5	3
Q9	2	3
Q10	2	3
Q11	1	3
Q12	1	3
Q13	1	3

Q14	2	3
Q15	1	2