

--	--	--	--	--	--	--	--

Fourth Semester B.E. Degree Examination, Jan./Feb. 2021 Design and Analysis of Algorithm

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Write an algorithm to find uniqueness of elements in an array and give the mathematical analysis of this non recursive algorithm with steps? (08 Marks)
- b. Define algorithm with specifications for writing algorithm. (06 Marks)
- c. Explain the following problem types: (06 Marks)
 - (i) sequencing
 - (ii) Sorting
 - (iii) Combinatorial problems

OR

- 2 a. Write the tower of Hanoi algorithm and steps for analysis of recursive algorithm. Show the analysis of above algorithm. (08 Marks)
- b. Discuss fundamental data structures. (06 Marks)
- c. Explain with example how a count variable is introduced in a program to find the number of steps required by a program to solve the problem. (06 Marks)

Module-2

- 3 a. Compare the straight forward method and divide and conquer method of finding maximum and minimum elements of the list. (08 Marks)
- b. Sort the following key word "ALGORITHM" by applying quick sort method. (06 Marks)
- c. Explain Divide and Conquer technique with general algorithm. (06 Marks)

OR

- 4 a. Show the number of element comparisons with example and show the proof of Binary search time for best, average and worst case analysis. (08 Marks)
- b. Apply topological sorting algorithm for the following graph shown in Fig. Q4 (b) and find the topological sequence? (06 Marks)

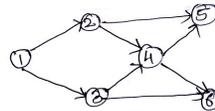


Fig. Q4 (b)

- c. Write Merge Sort algorithm for sorting using divide and conquer. (06 Marks)

Module-3

- 5 a. Construct the Huffman tree and resulting code word for the following set of values? (08 Marks)

Character	A	B	C	D	-
Probability	0.35	0.1	0.2	0.2	0.15

Encode the words DAD & ADD.

- b. Apply the prim's algorithm to obtain minimum cost spanning tree for the given weighted connected graph? (Refer Fig. Q.No.5(b)) (06 Marks)

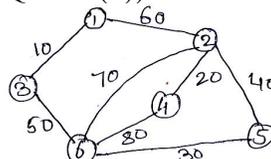


Fig. Q5 (b)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

- c. Find the optimal solution using greedy for the job sequencing with dead line problem with following values? $n = 5$.
 Profit = {10, 3, 33, 11, 40}
 Dead line = {3, 1, 1, 2, 2} (06 Marks)

OR

- 6 a. Explain bottom up heap construction algorithm with example. (08 Marks)
 b. Apply single source shortest path algorithm to the following graph. Refer Fig. Q.No.6 (b). Assume vertex 'a' as source. (08 Marks)

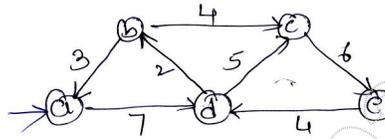


Fig. Q.No.6 (b)

- c. Apply greedy method to obtain an optimal solution to the knapsack problem given $M = 60$.
 $W = \{5, 10, 20, 30, 40\}$
 $P = \{30, 20, 100, 90, 160\}$
 Find total profit earned. (04 Marks)

Module-4

- 7 a. Explain multistage graph with an example. Write backward multistage graph algorithm. (10 Marks)
 b. Apply Floyd's algorithm to solve all pair shortest path for the given graph. (Refer Fig.Q7 (b)) (10 Marks)

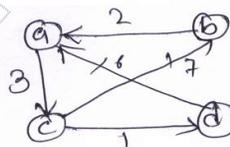


Fig. Q7 (b)

OR

- 8 a. Apply Warshall's algorithm to find the transitive closure of the following graph shown in Fig.Q8 (a). (10 Marks)

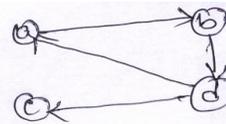


Fig. Q8 (a)

- b. Construct optimal binary search tree for the following set of values: (10 Marks)

Keys	A	B	C	D
Probability	0.1	0.2	0.4	0.3

Module-5

- 9 a. Apply best first Branch and Bound algorithm to solve the instance of the given job assignment problem.

J_1	J_2	J_3	J_4	
9	2	7	8	Person a
6	4	3	7	Person b
5	8	1	8	Person c
7	6	9	4	Person d

(10 Marks)

- b. Apply Back Tracking method to solve sum of subset problem for the instance $d = 30$, $S = \{5, 10, 12, 13, 15, 18\}$. Give all possible solution with state space for construction.

(10 Marks)

OR

- 10 a. Apply Branch and Bound method for Knapsack problem. $C = 10$

Items	1	2	3	4
Weights	4	7	5	3
Values	\$40	\$42	\$25	\$12

(10 Marks)

- b. Write short note on the following:

- (i) P
- (ii) NP
- (iii) NP-complete
- (iv) NP-Hard class problems

(10 Marks)

* * * * *

VTU EXAMS JAN / FEB 2021