

- Q1
- (a) Write $O(\log n)$ algorithm to find the n th fibonacci number 7
- (b) Solve the recurrence relation 7
 (z) $T(n) = 4T(n/2) + n^3$
 (zz) $T(n) = \sqrt{n} T(\sqrt{n}) + n$
- (c) Find the solution of the recurrence relation $f_n = f_{n-1} + f_{n-2}$ for $n \geq 2$, where $f_0 = 0$ $f_1 = 1$ 7
 OR
- (d) Solve the recurrence relation $T(n) = T(n-1) + \log n$ 7

- Q2
- (a) Formulate fractional knapsack problem and for the following instance of knapsack problem, find the solution. 7
 Capacity of knapsack bag = $M = 30$, Price and weight vectors of four commodities are
 $(p_1, p_2, p_3, p_4) = (20, 50, 15, 35)$
 $(w_1, w_2, w_3, w_4) = (15, 12, 5, 18)$
- (b) Using backtracking find the solution of the following sum of the subset problem. 7
 Given a set $S = \{15, 2, 50, 12, 4\}$ and a number $t = 14$. Find elements of S that are summed up to $t = 14$
- OR
- (c) Write algorithm for fractional knapsack problem 7
- (d) Solve the problem of Q5(b) taking $t = 27$ 7

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Q3 (a) Write the algorithm of quick sort to sort the elements in ~~the~~ decreasing order and find the time complexity of the algorithm. [7]

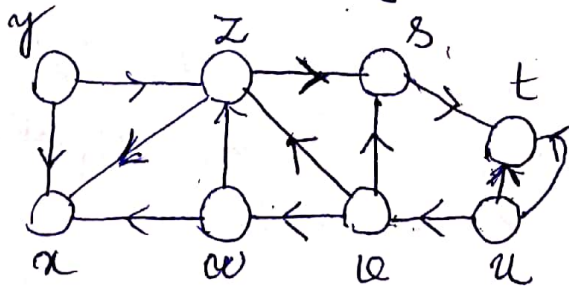
(b) Sort the following elements using quick sort.
5, 6, 7, 12, 4, 13, 20, 1, 22. [7]

(c) ~~For using sort~~ ^{or} using heap sort. Sort the ~~of~~ elements of Q 2(b). [7]

(d) you are given an array of $[P, r]$ of $(r-p+1)$ elements and a number a positive integer $1 \leq k \leq (r-p+1)$. Write an algorithm to find the k -th smallest element of the array. [7]

Q4 (a) Using BFS, write an algorithm to find the cycle in a graph and discuss its time complexity. [6]

(b) For the following ~~digraph~~ digraph find the DFS ~~tree~~ and spanning tree/forest and give the topological sort and classify the edges. [8]



Ref. if. any	Question No.	Subject Matter	Marks
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~~Q4~~

OR

(c) Modify the pseudocode for depth first search so that it prints ~~out~~ every edge in the directed graph G , together with its type.

7

~~(d) ~~and~~ (e) Discuss using~~

(d) ~~and~~ Answer the following

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(z) Write the steps to find the cycle in a graph using UNION-FIND() operations

7

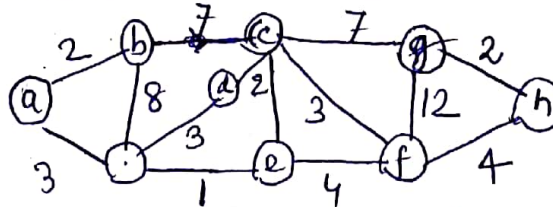
(ze) Using union by rank and path compression heuristics form the union of $A = \{a, b, c, d, y\}$ $B = \{1, 7, e, g, h\}$

Q5

(a) Write the pseudocode to find the maximum spanning tree of a weighted graph using Prim's algorithm, also discuss its time complexity

7

(b) For the following graph find the maximum spanning tree from vertex 'a'.



7

(c)

OR

Using Dijkstra's algorithm find the shortest paths from 'a' to the remaining vertices of the graph show in Q 4(b)

7

Continuation Pages.....

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(a) Modify Dijkstra's algorithm to find the single source longest paths ~~from~~ in a graph (Hint: Use MAX-Priority Queue).

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