

b) If a graph is unweighted then it is possible to find shortest path by using BFS (Breadth First search), But if the graph is weighted then we can not find the shortest paten by using BFS.

But here in this graph shough it is an weight and weighted graph. But all weight and equal. So for find shortest path the weight are not play any role. So for weight are not play any role. So for this graph it is possible to find shortest poth by using BFS.

[DFS can be used But BFS is commonly used unweighted to DFS united 2m. But efficient of BFS (0) 4MG)

b) Here is the pseudocode for union sets operation and find set operations, using path compression and union by nank heuristics.

forz union set operation:

un function union (n.y)

root y = find(r)

if ( not n = = nooty)

refunn

if [ rank ( nootr) L nank (rooty))

paneed (Toot n) = = root y.

else

parend [noot y] == root n.

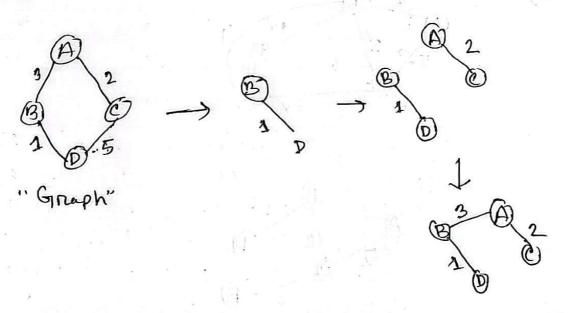
if ( rank ( root x) == rank t rooty))

Mank (Noot X == noo Mank (Tenootx) +1

fur	e tion find (n)	The state of the s
	if (panent (x) != n)	
31- 1	parent (x) == find (parent (n))	
	return parent (m)	
3. a) .	we know that knustal's algorithm's has timesmple	xity
0	(nlogn), and Bubble sont time complexity in the told in the question.	5 01
	50. T. a 171m 120 Al Harrell 1/2 Ala 116 acc	. 1
	so, The runtime of knuskal's algorithm assurance sonted using Bubble sont would be 012	Reim
	tipe district coopsie song would be ul	1)
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	"Minimum spanning Tree wing Prim's Algon	



E) knus kal's algorithm is a greedy algorithm that finds the MST (Minimum Spanning Tree) From a graph. It works by stanting with each node its own tree, then select the edge with the lowest cost and connect so on. This Process repeats is antill all rode one connected froming a sigle true. So, at first it makes



"MST Using Krustal's"

2.0 Find-set (3) = 1) compane with ponent of 3 is enequal on equal. if it is enequal then find the panent of the 3's panent. find (2) = 1, Find(1) = 1, neturn 1. so, findat (3) = 1 findset(6) = 1. Find (6) = 3, Find (3)= 2 find(2)=1 Find(1)=1 netann find set (5) = 1, find (5) = 3 find(3) = 2 KnA(2)=1 Frd(1)=1 return 1 find (3) = 1.



4. a)

A graph Conteins ventices (A, B,C, D, E, F, G) and Shortest path from A to Bis A > E + C + D + F + G + B, Using this information it is possible to find the shortest path from E to F.

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Because, F-) C-) D-) F is included for finding.

A to B Shortest path. So, it A to B is the Shortest path. So E to F also the shortest path.

b) Here for finding shortest patu we need to use Bellmen fond algorithm. Z is sounce rantex.

			-2			_ :\_	7	a	61	n	X	
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	F	CX	-4	B		BX	0	6	a oc	āC.	2 0	
Ust		Cq.	9	-(0)		ab b		/	1			
B	021		by	\$ 5	14	8	/	1				
7	0	a	a	à	X	٧.		1.	1			
a	0	[6]	7	×	d	1			1	1		
n	0	6	7	d	d			•	V.		1	
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	Patricia di	7	1		e i pe de	
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head y is unneachable. from 2.

lue Shontest patu tree satisfies the optimal substructure Property because, if we have a shortest path from the Source vertex v and we also have a Shortest path from v to another vertex v. then the Concatenation of these two paths will also be the Shortest path from the Source vertex to vertex v. This means that the optimal Solution for a sub problem can be obtained by Combining the optimal solution of its sub-supproblems thus the Shortest path tree satisfy the optimal substructure property.



5. a) Benefits of a good hash function is Timecomplexity O(1).

A good hash Function allows for Fost and afficient lookup, insention and deletion of data in a hash table.

b) A linked list is ithe best data of structure for implementing chaining Hash table as it offens best time complexity, for the operation, insention, seanem and deletion.

Insention of into a linked list time complexity is O(1), then seanching IS O(n) and petetion From a linked List is O(n). and for Binary seanch tree the time complexity for a Insention, seanch and petetion is O(logn), o(logn), o(logn).
But in generally. Linked List is good

For this operation because it is fastere and But if we ansiden only time complexity of Insertion, serner and peletion. tuen Binny seance tree would be betten solution. 0 (10gn) 2 0 (n) 6. a) In string matching some times it can be happen tuet, numerical value materied but the String does not mateu. And this is spurious wit. The reduce spurious wit. we use politing hoster function. Text = a b c a a b b c string = 66C = 2x102+2x10+3x100 = 200 + 20+3 = 223.and we it used a a prime number for mode. suppole P= 13. 2237013 = 2 and for next window calculation it used, [ Prene Window value - 102 x (nevchanceten value) ] x 10+ using this function wer calculater and value / 90 4. ABU Find tue Stri Substring,

Longer Pain relief | Better safety

b) Text = fedable a

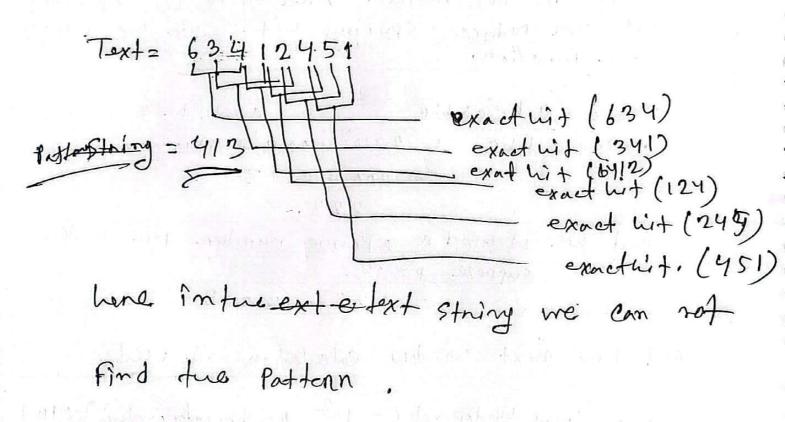
allumithat P= 13.

pattern = dac.

= 4.13

and using next window function is:

(Prévious window value - 102 x Prev chan value) X10 + mext chan value) Mode 13



so pattenn does not exists in tall string.

7.	a) 10 Co dala 11 1115
	1) NO Complete: FI Problem
	in the slaw NO aproblem that can be solved in
	polynomial time by a non deterministic algorithm
	and every other problem in NP can be reduced
	·to it in polynomial time.
	ii) P: A Problem is that can be solved in
	Polynomial time by a deterministic algotive
	algoritum that is polynomial Problem.
	got Hother bother to party of the
	iii) NP-hand: A Problem is NP-hand if it is
NA -	
	at least as hand as the handest problems in
A WICEY IS	NP. In other words, if an NP-hand proble
	can be solved in problem in polymomial time,
	then all problems in NP can also be solved
	in polynomial Ame.



Beadta First seanch Can cheate a minimum spanning therefore unweighted graphs" twis statement is true. Becauses

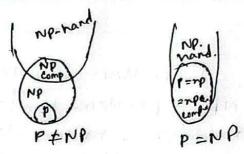
A MST is a true is truct connects all the modes of a graph and has a true minimum total edge weight.

And in an ++ un weighted graph all edge weight is same, and snortest path between two modes is the path with the fewest noteedges, and BFS do the same.

so BFS canbe used create a minimum spanning tree for unweighted graph.

2. a) union by Pank is a way to make the Disjoint set union (DSV) data structure more efficient. DSV is a way to group things together that are connected. union-by-Pank is a rule that is used to decide which group will be the main group. When two group are Joined together. It does this by giving each group a number (Pank) based on how big it is. The group with the Smaller number becomes the main group. This keeps the groups grade as possible. and it make the Day more





Here in left side da diagram shows that proper and in the Flight right side.

Shows that P= np.

But we can say that NP & P. Because
it is not known whether NP = P or NP & P.
But many expents believe that NP & P.

so, though it is not cleated But generally
P & NP. and it is the most important
open problems in Computer Science.