Even Semester Term-II Examination, May-2021

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Year - 2nd

Stream - B.Tech (BCSE)

Section - A

Class Roll Number - 56

Enrollment Number - 12019009001262

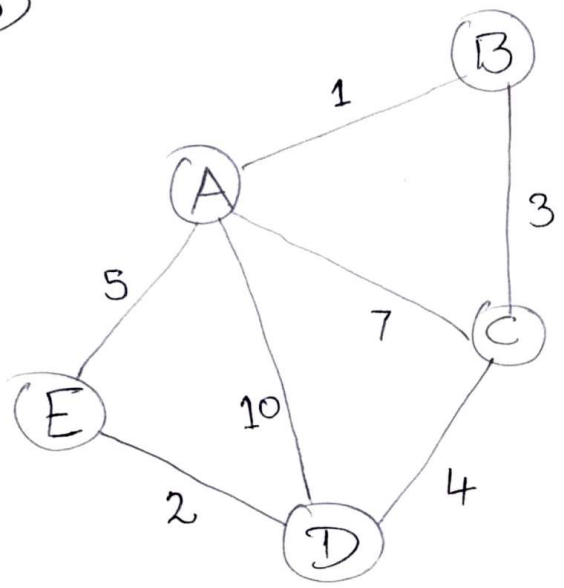
Paper Name - Design & Analysis of Algorithm

Paper Code - PCCCS402

Signature - Shivam Sharma

Date - 06/05/2021

1. B)

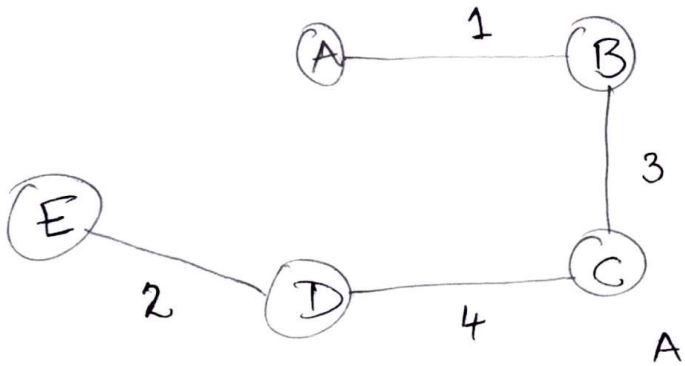


This is the graph.

No. of vertex = 5

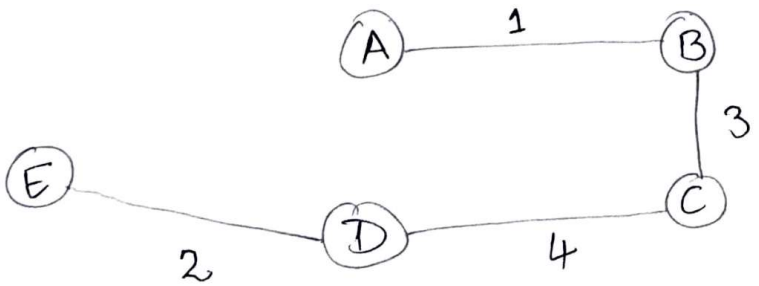
No. of edges = 4.

Min => A to B



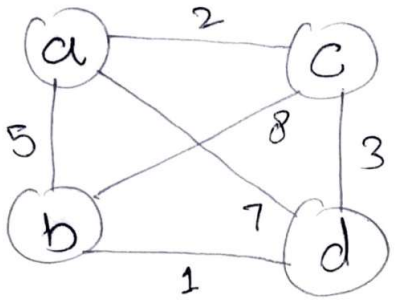
A → E, A → D, A → C not possible as it will form a cycle.

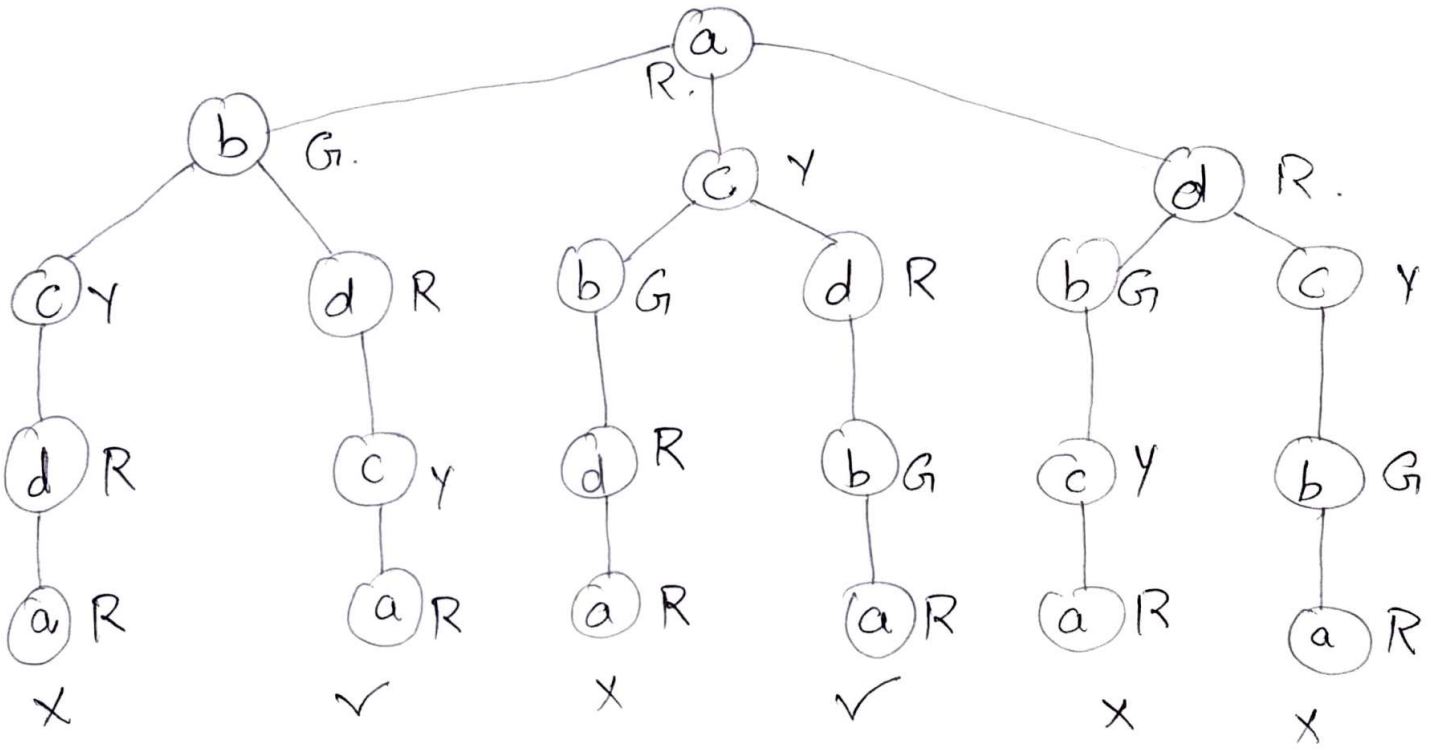
So, the minimum spinning tree is,



Total weight = 10.

2. A)



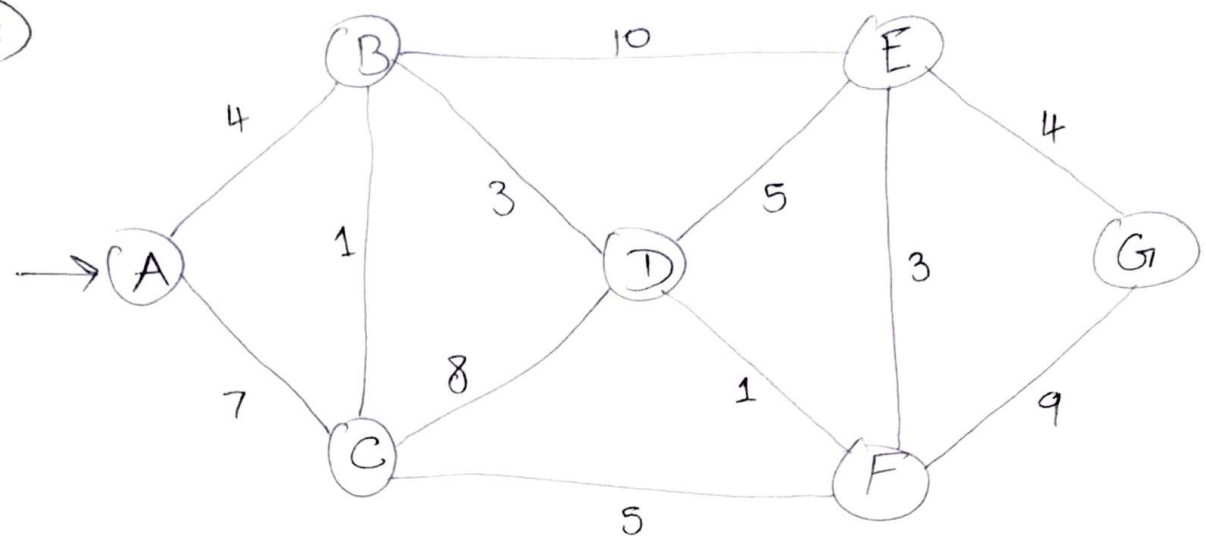


Hence the loop will be a-b-d-c-a

& a-c-d-b-a

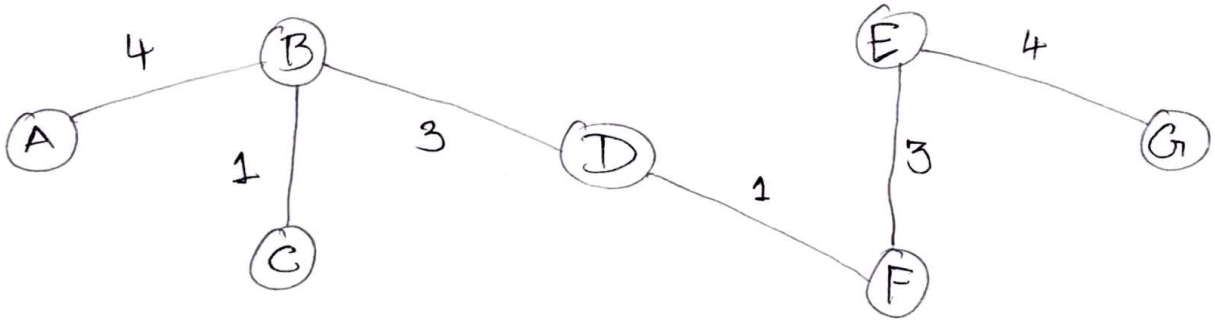
where a is Red, b is Green, c is yellow and d is Red.

3.A)



From A

Use Kruskal Algorithm. Find Minimum Spanning Tree From the given graph.



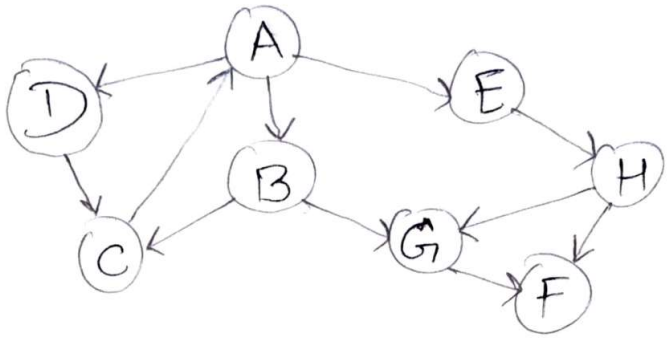
Minimum - ⟶ Minimum SPANNING TREE

Travel Cost Is = Minimum Cost of Spanning Tree

Minimum Cost is = (4 + 1 + 3 + 1 + 3 + 4)

= 16 (ans)

4.b)



If there is ever a decision between multiple neighbour nodes in the BFS & DFS algorithm. we will always close the letter closest to the beginning of the alphabet first.

Process -

A → B → D
B → C → E - G
D → C
C → A
E → H
G → F
H → F → G

So, the Breadth First search for the given graph is

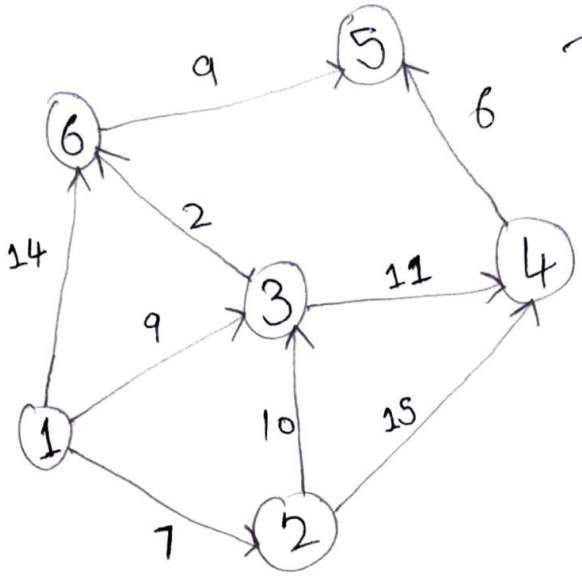
→ ABDCEGHF.

DFS is

→ ABCEHFGD.

So

5.B)

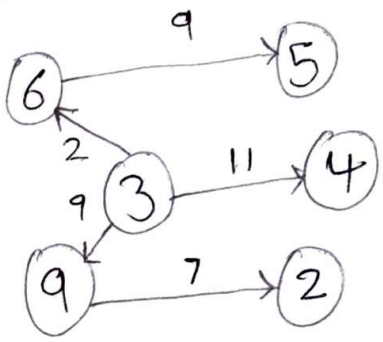


→ Dijkstra algo.

If $d(u) + c(u,v) < d(v)$

$d(v) = d(u) + c(u,v)$

Now representing :-



Source	Destination				
	2	3	4	5	6
	∞	∞	∞	∞	∞
	(7)	9	∞	∞	14
1, 2	(7)	(9)	22	∞	14
1, 2, 3	(7)	(9)	20	∞	(11)
1, 2, 3, 6	(7)	(9)	20	∞	(11)
1, 2, 3, 6	(7)	(9)	20	∞	(11)
1, 2, 3, 6, 4	(7)	(9)	(20)	20	(11)
1, 2, 3, 6, 4	(7)	(9)	(20)	(20)	(11)
1, 2, 3, 6, 4, 5	(7)	(9)	(20)	(20)	(11)

All Shortest Path from Source – 1 .

6. A) $I = (I_1, I_2, I_3, I_4, I_5)$

$W = (5, 10, 20, 30, 40)$

$V = (30, 20, 100, 90, 160)$

The capacity of knapsack $W = 60$

Now, fill the knapsack according to the decreasing value of p_i.

First we choose the item I_i, whose weight is 5

Then choose item I_3 whose weight is 20.

Now, the total weight of knapsack is $20+5 = 25$

Now the next time is I_5 and its weight is 40 but we want only 35. So, we choose the fractional part of it,

i.e. $5 \times 5/5 + 20 \times 20/20 + 40 \times 35/40$

weight $= 5 + 20 + 35 = 60$

Maximum Value :-

$30 \times 5/5 + 100 \times 20/20 + 160 \times 35/40$

$= 30 + 100 + 140 = 270$ (Minimum Cost)

ITEM	W_i	V_i
I_1	5	30
I_2	10	20
I_3	20	100
I_4	30	90
I_5	40	160

Taking value per weight ratio i.e. $P_i = V_i / W_i$

ITEM	W_i	N_i	$P_i = N_i / W_i$
I_1	5	30	6.0
I_2	10	20	2.0
I_3	20	100	5.0
I_4	30	90	3.0
I_5	40	160	4.0

Now, arrange the value of P_i in decreasing order.

ITEM	W_i	N_i	$P_i = N_i / W_i$
I_1	5	30	6.0
I_3	20	100	5.0
I_5	40	160	4.0
I_4	30	90	3.0
I_2	10	20	2.0

7. B)

Tractable Problem - A problem that is solved by a polynomial-time algorithm.
The upper bound is polynomial.

For Example - •) Searching an unsorted list.
•) Searching an ordered list.
•) Sorting a list.
•) Multiplication of integers.
•) Finding minimum spanning tree in a graph.

Intractable Problem - A problem that cannot be solved by a polynomial-time algorithm. The lower bound is exponential.

From a computational complexity stance, intractable problems are problems for which there exists no efficient algorithm to solve them.

For Example - •) Towers of Hanoi, we can prove that any algorithm that solves this problem must have a worst-case running time that is atleast $2^n - 1$.
•) List of all permutations of n numbers.