Maximum Sub Array Sum

1. [-2, -3, 4, -1, -2, 1, 5, -3]

maxsum = -∞
currentsum = 0

i) currentsum = 0+(-2) = -2
Maxsum = -2
currentsum = 0

ii) currentsum = 0 + (-3) = -3 <0
MaxSum = -2
currentsum = 0

iii) currentsum = 0+$\boxed{4}$=4 >0
MaxSum=4
currentsum = 4 >0

iv) currentsum = 4-1 = 3
Maxsum = 4
currentsum = 3

v) currentsum = 3-2 = 1
Maxsum = 4
currentsum = 1

vi) currentsum = 1+1 = 2
Maxsum = 4
currentsum = 2

vii) currentsum = 2+$\boxed{5}$=7
Maxsum = 7
currentsum = 7

n digits → n steps

if (currentsum > maxsum)
  maxsum = currentsum
if (currentsum < 0)
  currentsum = 0

viii) currentsum = 7-3 = 4
Maxsum = 7
currentsum = 4

Max Sub Array: 4, -1, -2, 1, 5

[3, -4, 5, 4, -1, 7, -8]

maxsum = $-\infty$
currentsum = 0

i) currentsum = 0+3 = 3
Maxsum = 3
currentsum = 3

ii) currentsum = 3-4 = -1
Maxsum = 3
currentsum = 0

iii) currentsum = 0+5 = 5
Maxsum = 5
currentsum = 5

iv) currentsum = 5+4 = 9
Maxsum = 9
currentsum = 9

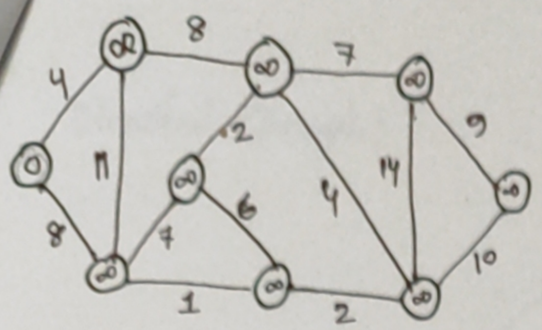
v) currentsum = 9-1 = 8
Maxsum = 9
currentsum = 8

vi) currentsum = 8+7 = 15
Maxsum = 15
currentsum = 15

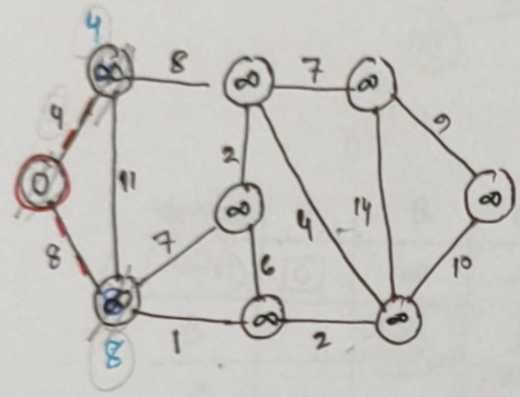
vii) currentsum = 15-8 = 7
Maxsum = 15
currentsum = 7

Max SubArray: [5, 4, -1, 7]

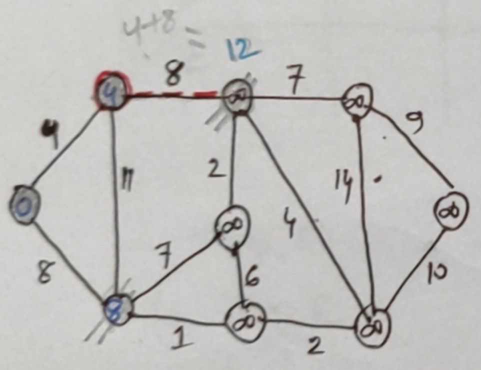
Dijkstra



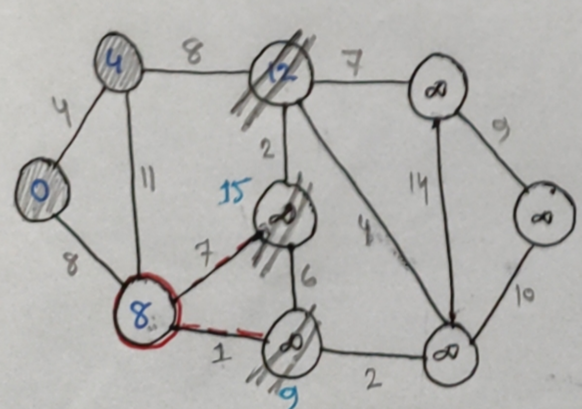
step1:



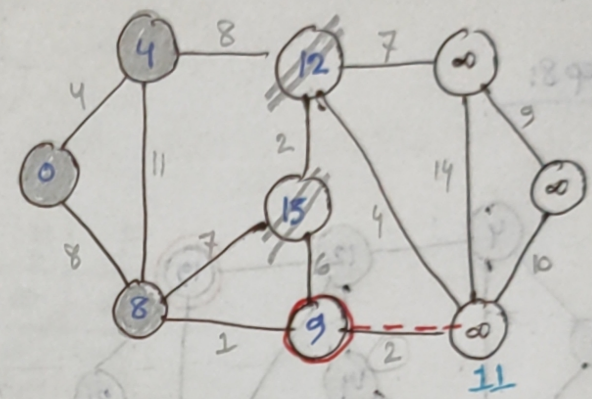
step2:



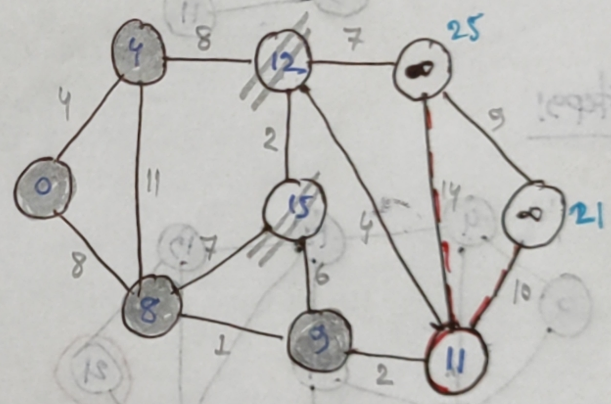
step3:



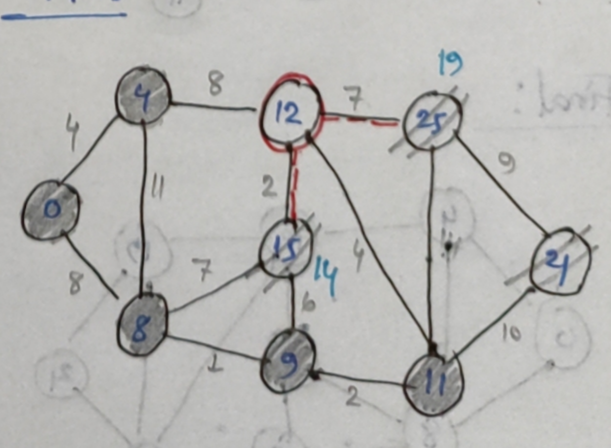
step4:



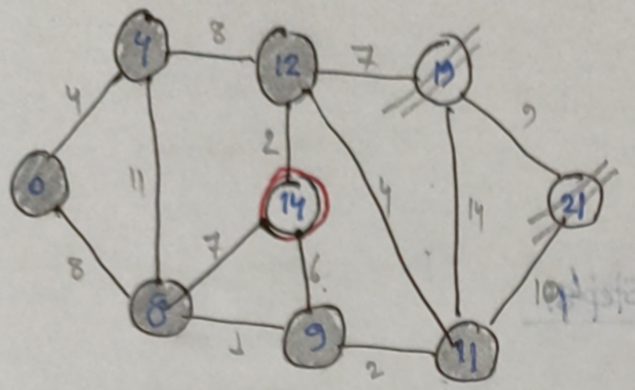
step5:



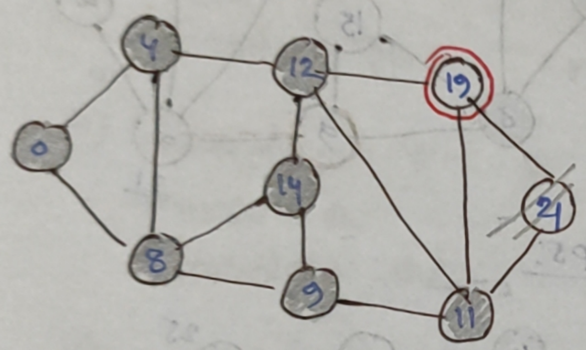
step6:



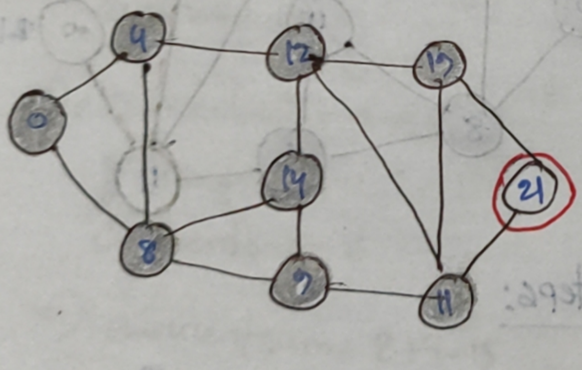
step 7:



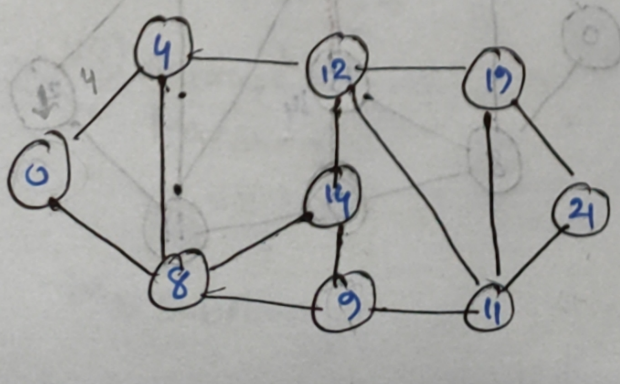
step 8:



step 9:

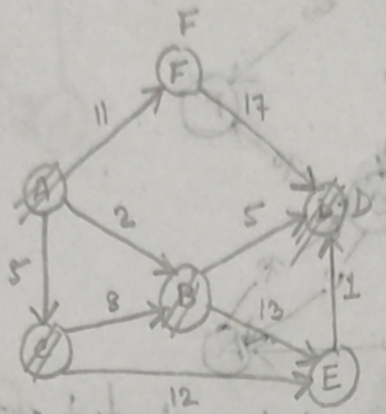


Final:



Dijkstra's Algorithm

Directed Graph:

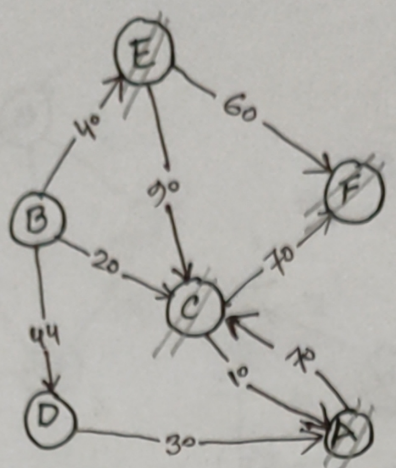


Vertex	A	B	C	D	E	F
A (initial)	$\boxed{0}$	∞	∞	∞	∞	∞
B		$\boxed{2}$	5	∞	∞	11
C			$\boxed{5}$	7	15	11
D				$\boxed{7}$	15	11
F					15	$\boxed{11}$
E					$\boxed{15}$	

E, B, A

↳ A, B, E

$2 + 13 = 15$



Apply Dijkastra's Algorithm to find the shortest paths from E.

Show all steps.

Vertex	E	A	B	C	D	F
E	0	∞	∞	∞	∞	∞
F	0	∞	∞	90	∞	$\boxed{60}$
C	0	∞	∞	$\boxed{90}$	∞	60
A	0	$\boxed{100}$	∞	90	∞	60

Applying Dijkastra's Algorithm we get,

$E \to A = 100 \Rightarrow E \to C \to A$

$E \to B = \infty \Rightarrow$ unreachable from E to B

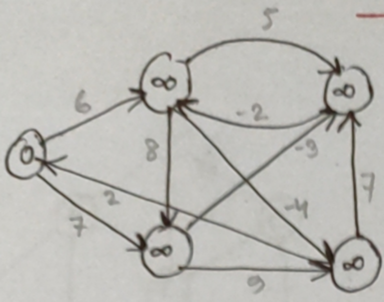
$E \to C = 90 \Rightarrow E \to C$

$E \to D = \infty \Rightarrow$ unreachable from E to D

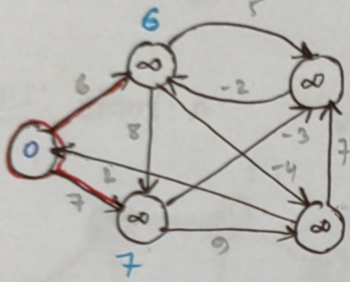
$E \to E = 0 \Rightarrow E$

$E \to F = 60 \Rightarrow F \to F$

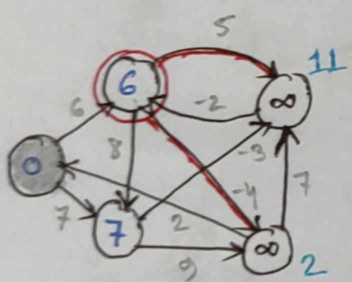
Bellman Ford



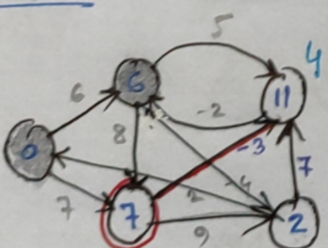
step1:



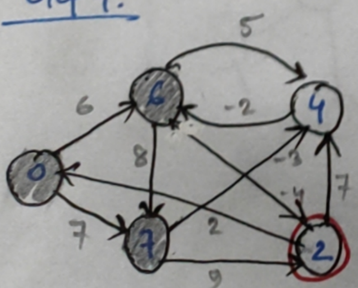
step2:



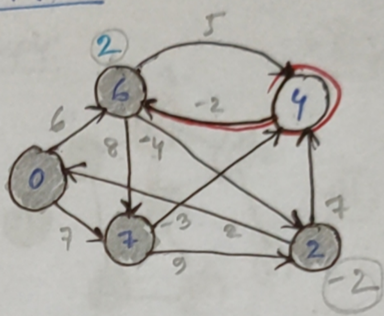
step3:



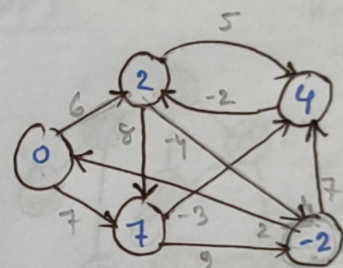
step4:



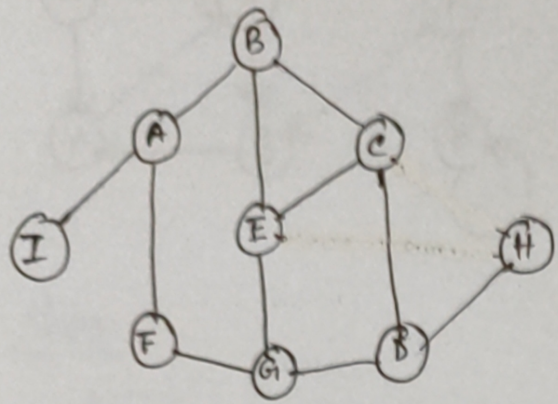
step5:



Final:



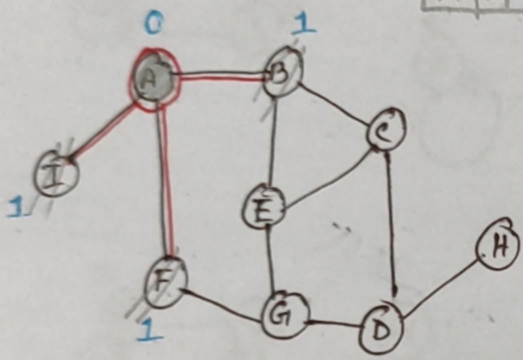
BFS



step1: start: A

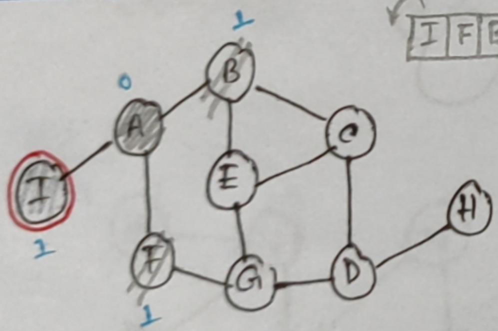
Queue:

A	I	F	B



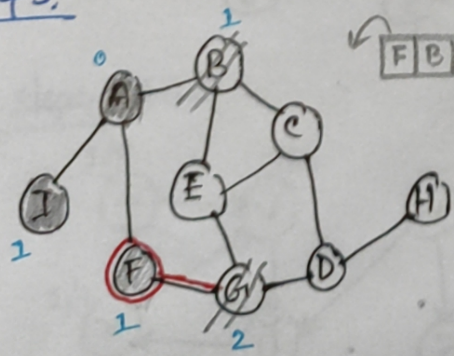
step2:

I	F	B



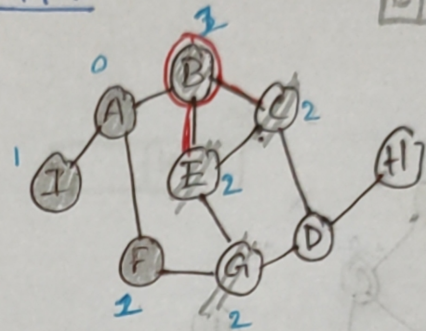
step3:

F	B	G



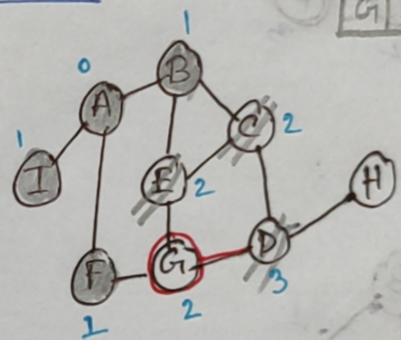
step4:

B	G	E	C



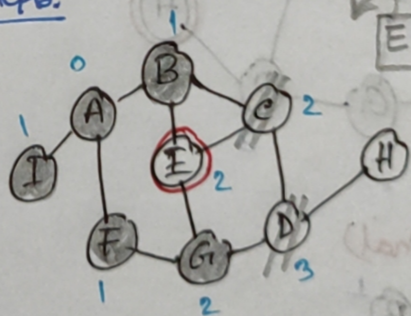
step5:

G	E	C	D

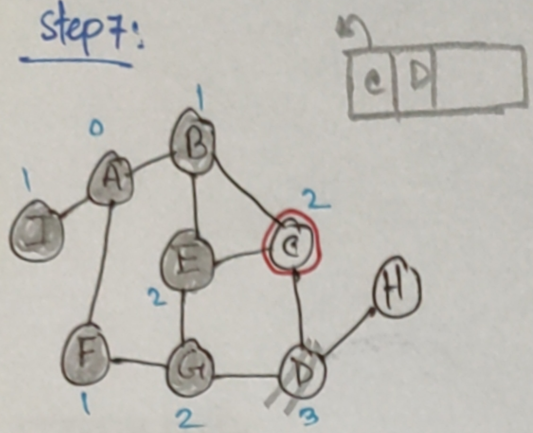


step6:

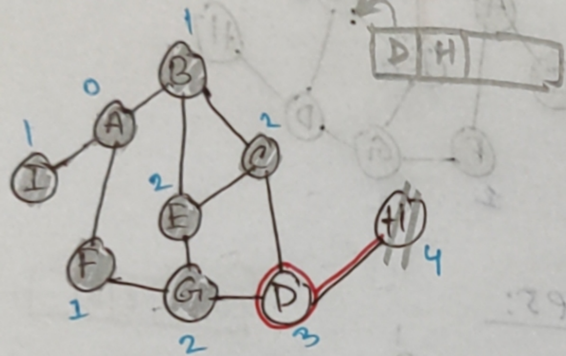
E	C	D



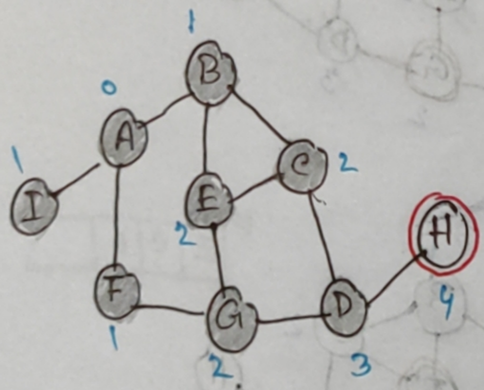
step7:



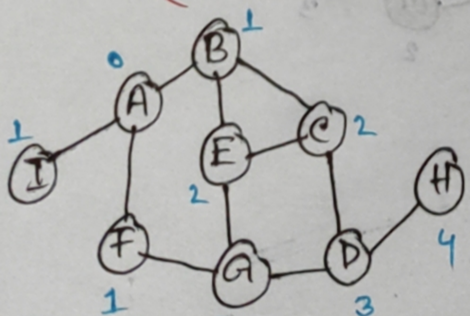
step8:



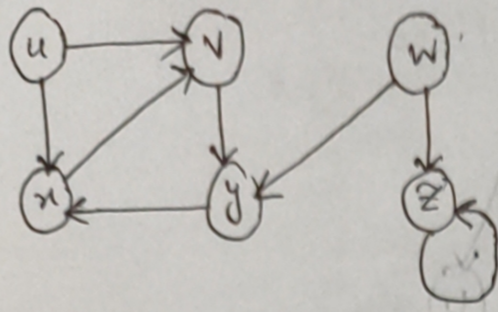
step9:



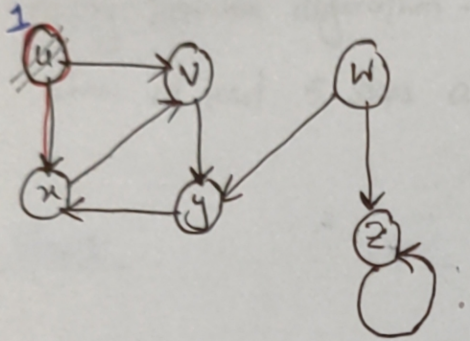
step10: (Final)



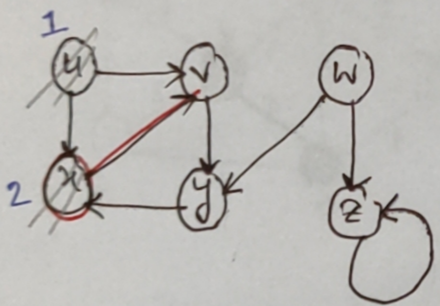
DFS



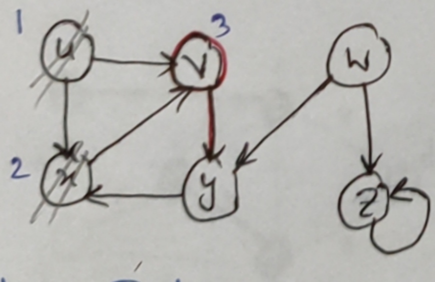
step 1:



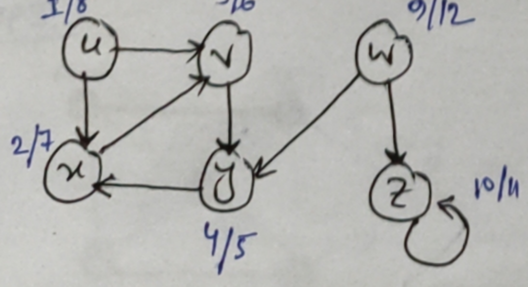
step 2:

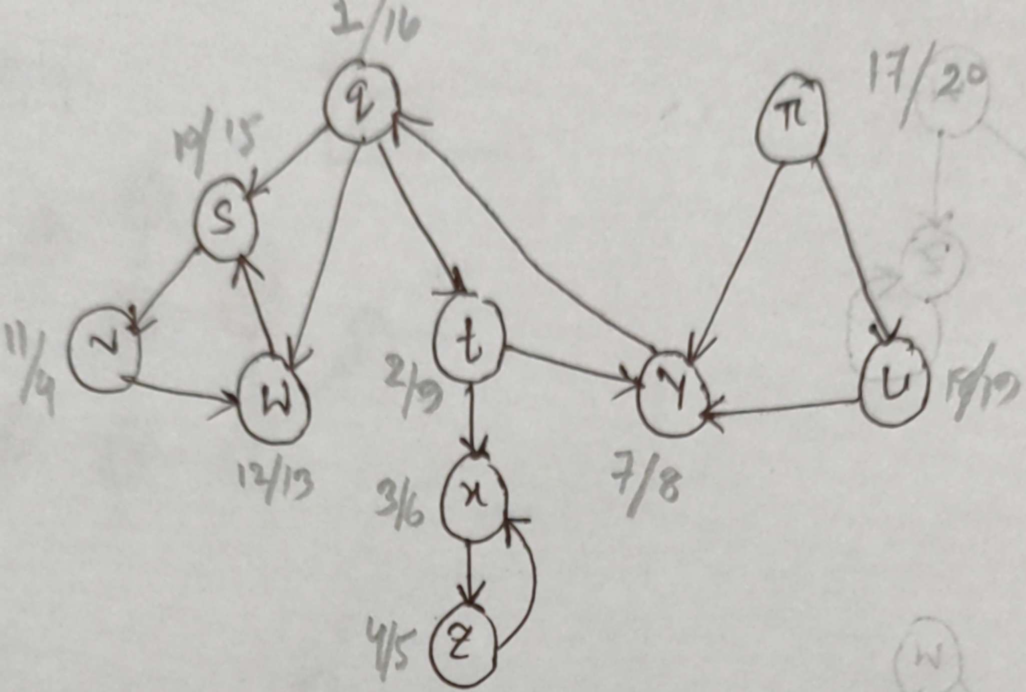


step 3:

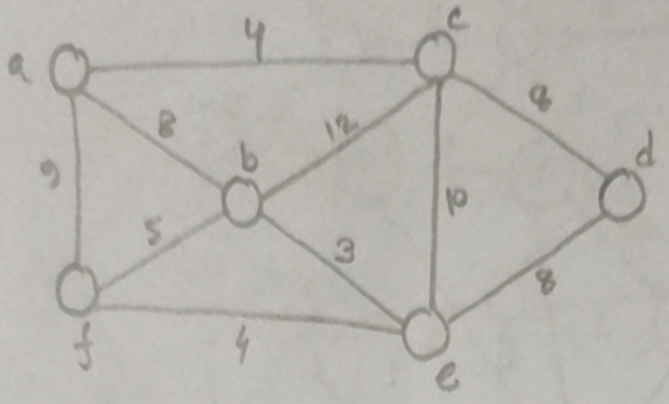


step 4: Final



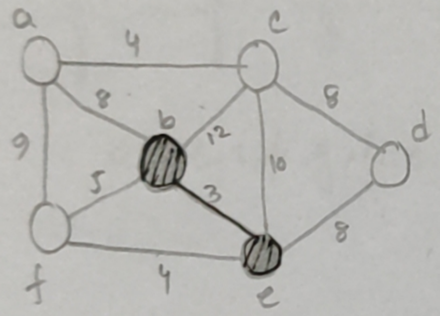

1/16
q
10/15
s
11/14
v
w
12/13
t
2/9
x
3/6
z
4/5
y
7/8
π
17/20
u
18/19

Krushal

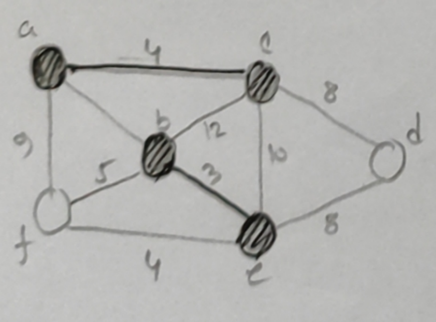


Apply Kruskal algorithm to find the minimum spanning tree.
Show at least 5 steps and the final tree.

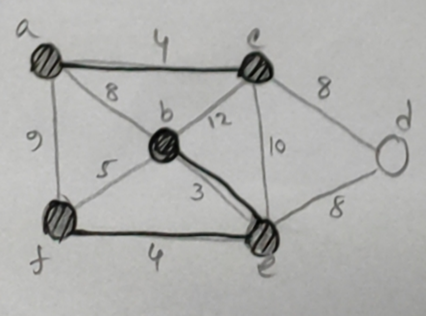
Step 1:



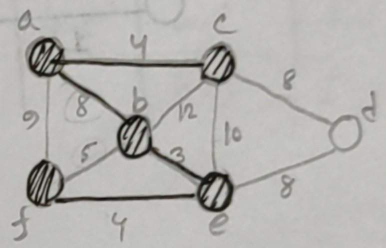
Step 2:



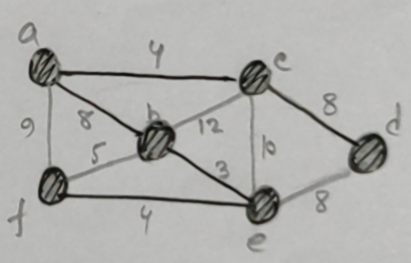
Step 3:

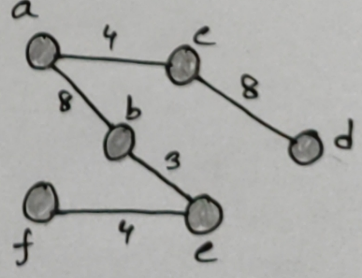


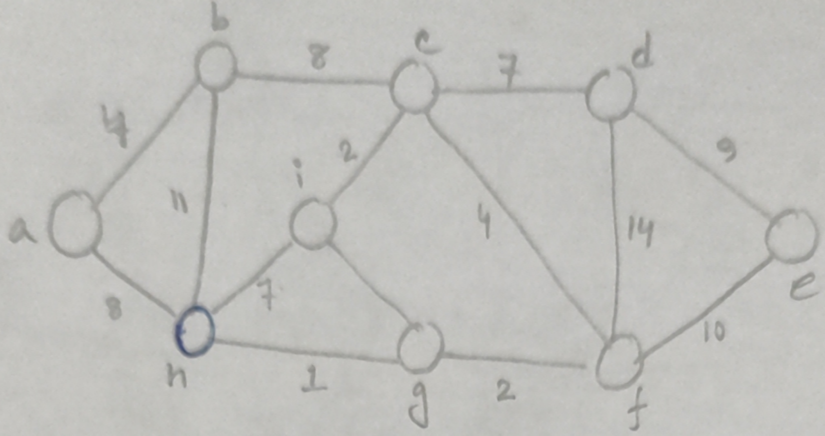
step 4:



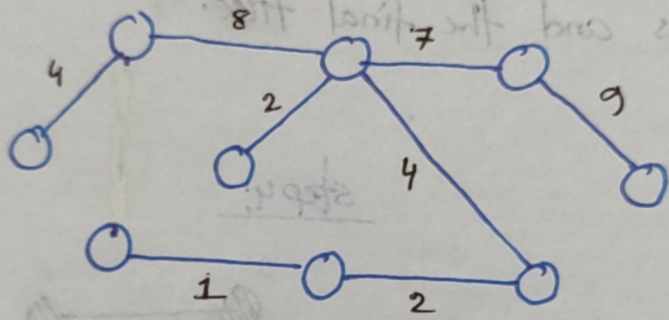
Final:





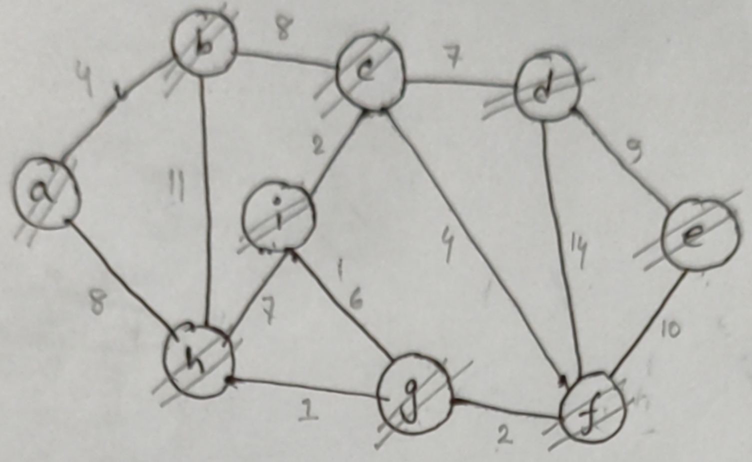


a
b
c
d
e
f
g
h
i
4
8
8
7
11
2
7
4
14
9
10
1
2



4
8
7
2
9
4
1
2

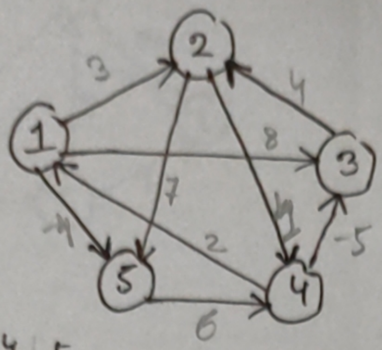
Prims



Node	a	b	c	d	e	f	g	h	i
key π	0, Nil	∞	∞	∞	∞	∞	∞	∞	∞
		4, a	8, b	7, c	10, f	4, c	6, i	8, a	2, c
					9, d		2, f	1, g	

a, b, c, i, f, g, h, d, e

Floyed Warshall



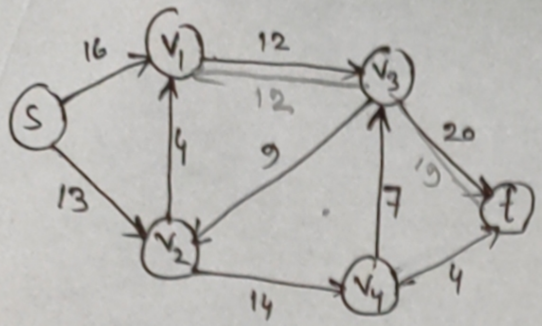
$$D^{(0)} = \begin{array}{cc} & \begin{matrix} 1 & 2 & 3 & 4 & 5 \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{matrix} & \begin{bmatrix} 0 & 3 & 8 & \infty & -4 \\ \infty & 0 & \infty & 1 & 7 \\ \infty & 4 & 0 & \infty & \infty \\ 2 & \infty & -5 & 0 & \infty \\ \infty & \infty & \infty & 6 & 0 \end{bmatrix} \end{array}$$

$$D^{(1)} = \begin{array}{cc} & \begin{matrix} 1 & 2 & 3 & 4 & 5 \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{matrix} & \begin{bmatrix} 0 & 3 & 8 & \infty & -4 \\ \infty & 0 & \infty & 1 & 7 \\ \infty & 4 & 0 & \infty & \infty \\ 2 & 5 & -5 & 0 & -2 \\ \infty & \infty & \infty & 6 & 0 \end{bmatrix} \end{array}$$

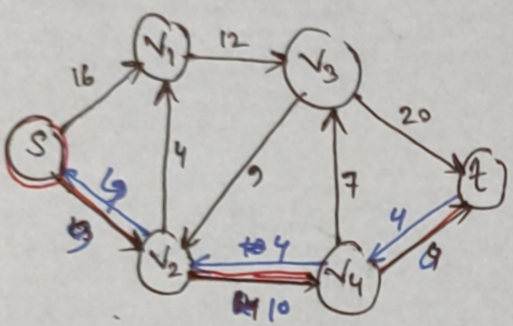
$\cancel{D^{(2)}}$

$$D^{(2)} = \begin{array}{cc} & \begin{matrix} 1 & 2 & 3 & 4 & 5 \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{matrix} & \begin{bmatrix} 0 & 3 & & & \\ \infty & 0 & \infty & 1 & 7 \\ & 4 & 0 & & \\ & 5 & & 0 & \\ & \infty & & & 0 \end{bmatrix} \end{array}$$

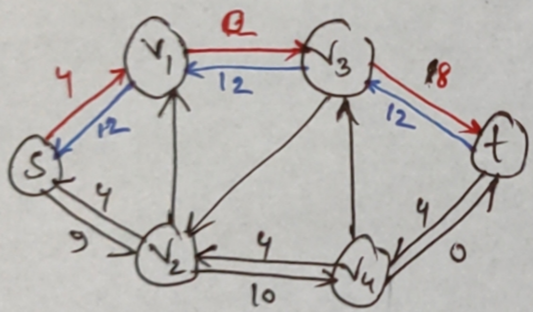
Flow Network



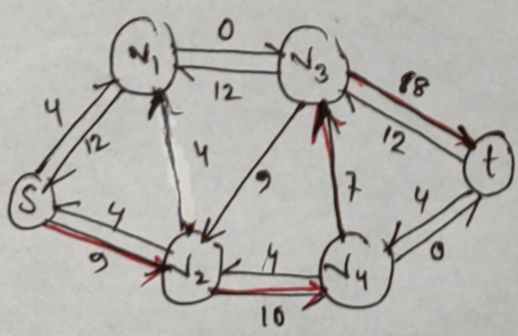
step 1:



step 2:



step 3:



step 4: