Dijistra Algorithm

⇒ Single source shortest path problem

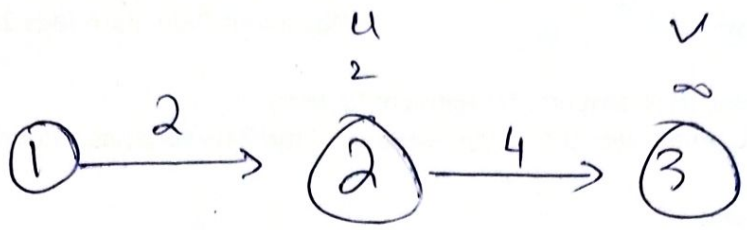
⇒ if weight graph is given, then from one source node to any other ~~ex~~ vertex

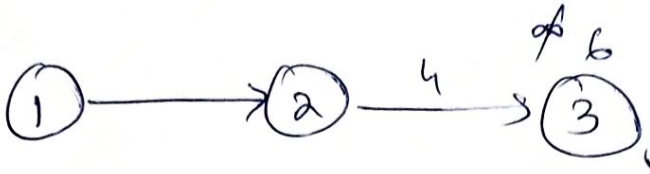
⇒ It is optimizing / minimizing problem so will be done by greedy algo.

→ Can work on both directed / undirected graph.

→ used for DNA mapping / Google maps

Take Simple example





This is relaxation.

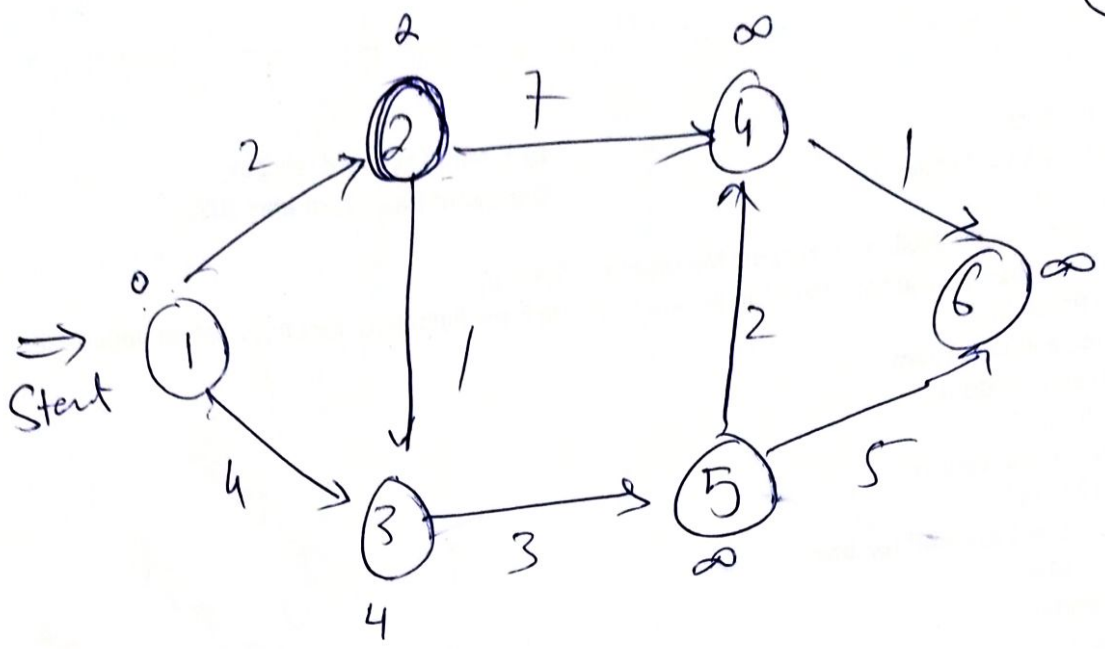
if (d(u) + c(u,v) < d[v]

d(u) ↓ distance

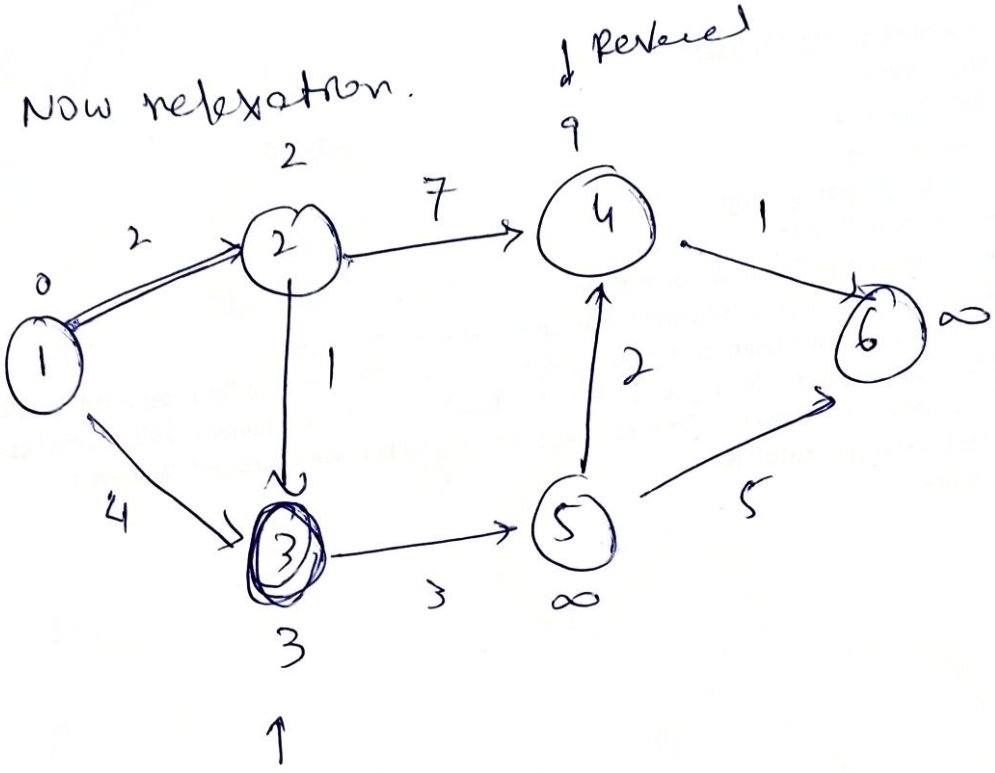
c(u,v) ↓ cost of edge

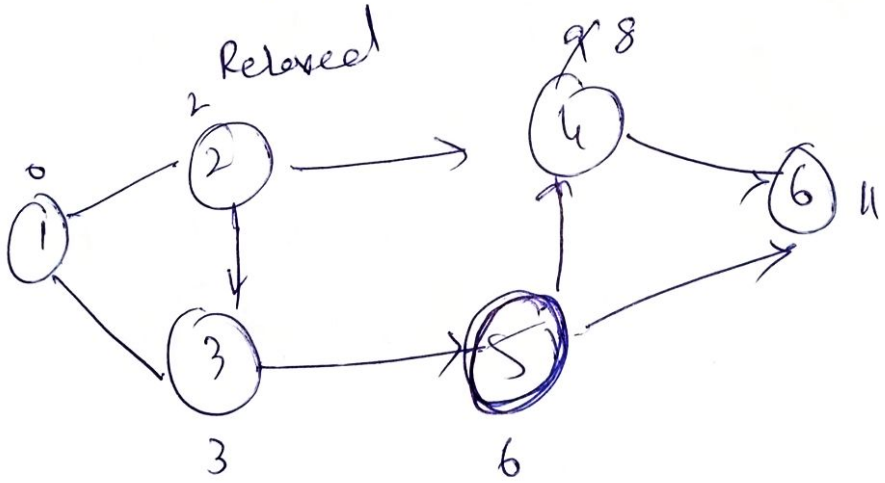
$$d[v] = d[u] + c(u,v)$$

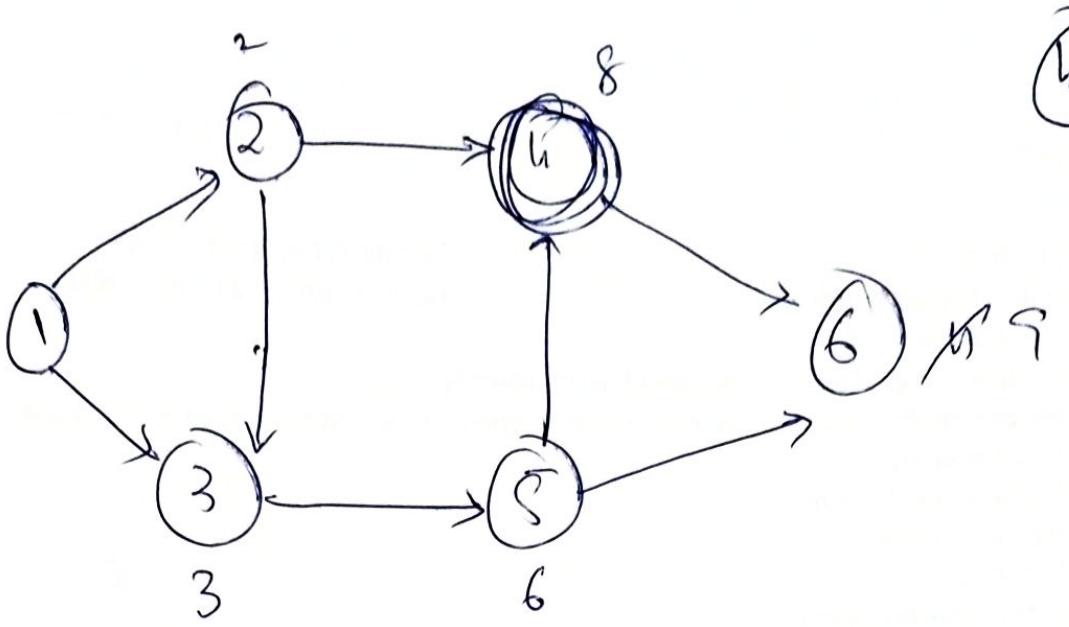
This is what we do in dijistra.



Now relaxation.







v	d[v]
2	2
3	3
4	8
5	6
6	9

=> Analyze.

Finding shortest for all V

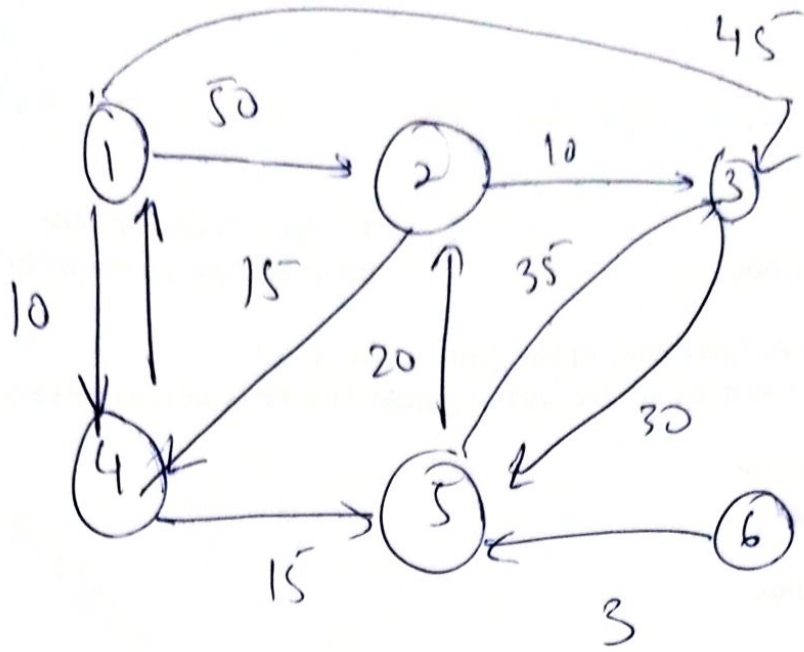
So $n = |V|$

~~After~~ after relaxing some vertices could be $|V|$ so $|V|$

$n \times n$

So n^2 (If graph is complete)

Heap $E \lg V$



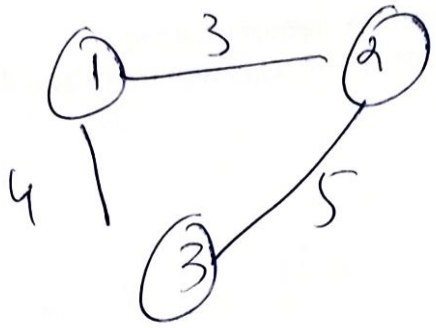
~~Select~~ Starting 1

Selected Vertex

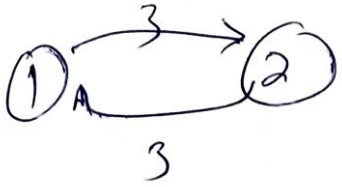
↓	2	3	4	5	6
4	50	45	(10)	∞	∞
5	50	45	(10)	(25)	∞
2	(45)	45	(10)	(25)	∞
3	(45)	(45)	(10)	(25)	∞
6	45	45	10	25	∞

if selected already, ignore.

=> Work on non directed

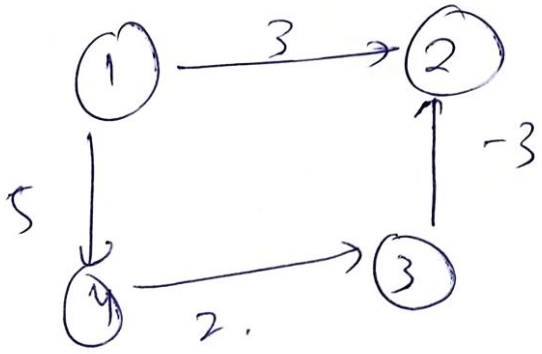


Convert to directed



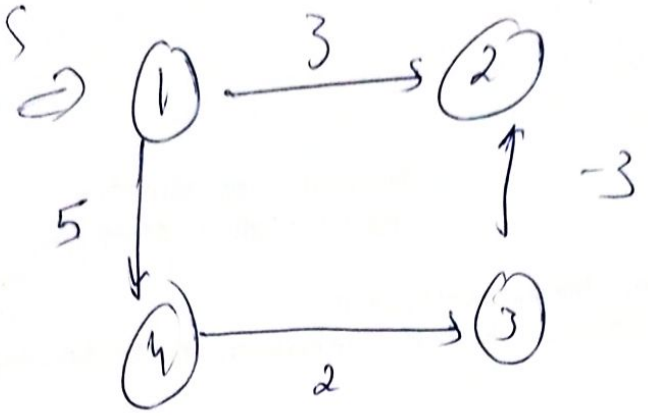
So now its easy.

=> Drawback.

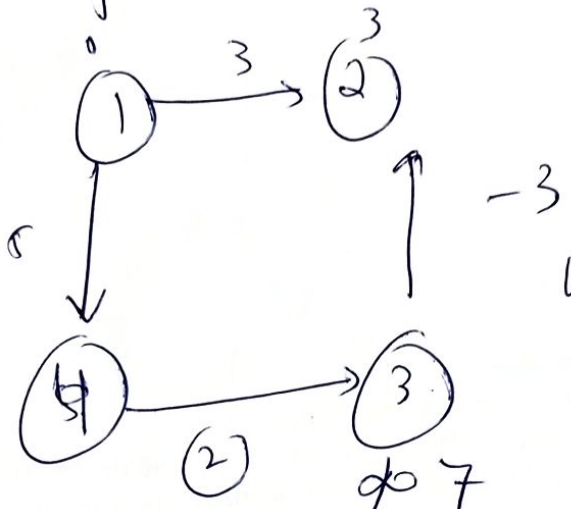


So business problem here - ve.

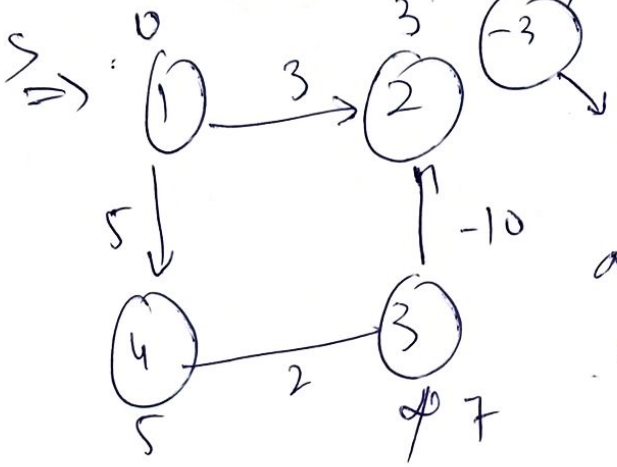
e.g Banking transaction, Stock Predictions



start form one then

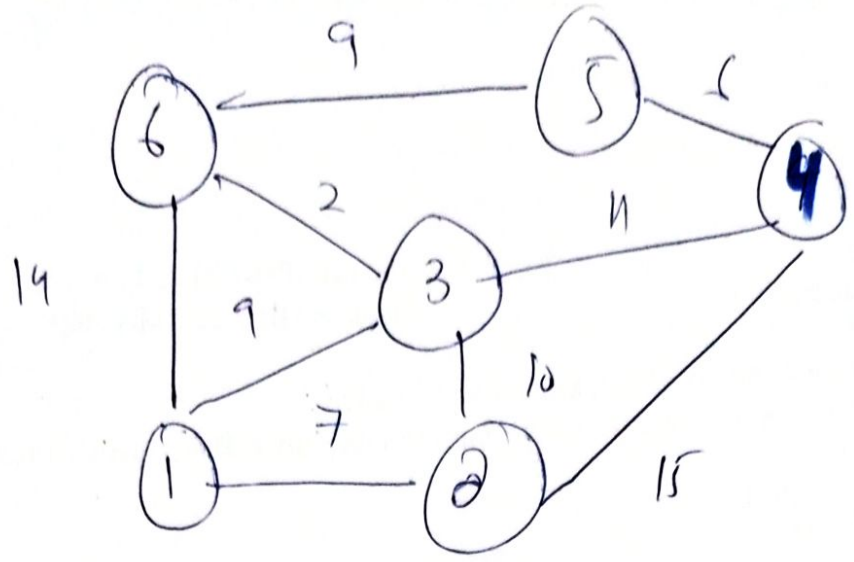


So it worked, now a small change

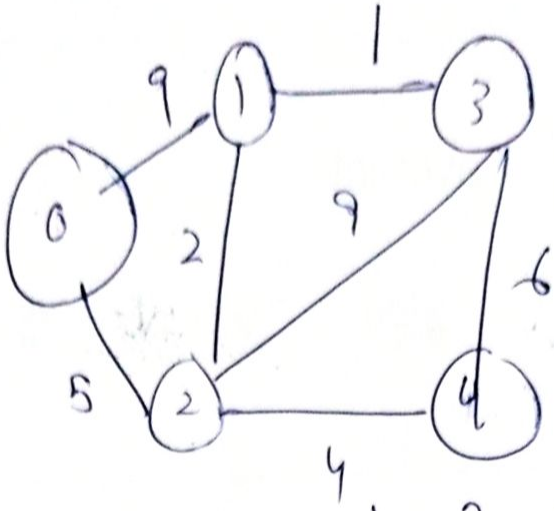


This is the right answer but this algo ignores it

(8)



	1	2	3	4	5	6	
		∞	∞	∞	∞	∞	
		7	9	∞	∞	14	
1,2		7	9	22	∞	14	
1,2,3		7	9	20	∞	11	1,3,6,5
1,2,3,6		7	9	20	20	11	
1,2,3,6,4		7	9	20	20	11	

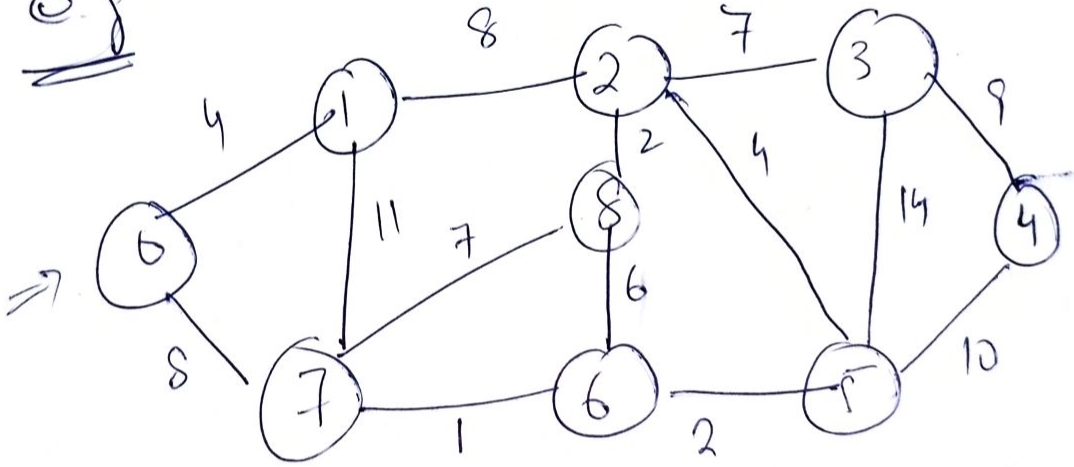


	0	1	2	3	4
visited	F	F	F	F	F

	0	1	2	3	4
distance	0	∞	∞	∞	∞

0 7 8 8 9

Q 8



1	2	3	4	5	6	7	8
4	12	19	21	11	9	8	14