Assignment - 03

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sec: 10

1.

We have to use Dijkstra algorithm here:

selected vertex	vertex - distance						
	E	F	A	B	C	G	D
E(0)	⓪	∞	∞	∞	∞	∞	∞
F(2)	⓪	②	∞	∞	∞	∞	∞
A(5)	⓪	②	⑤	∞	11	∞	∞
B(10)	⓪	②	⑤	⑩	11	∞	∞
C(11)	⓪	②	⑤	⑩	⑪	∞	12
D(12)	⓪	②	⑤	⑩	⑪	15	⑫
G(14)	⓪	②	⑤	⑩	⑪	⑭	⑫

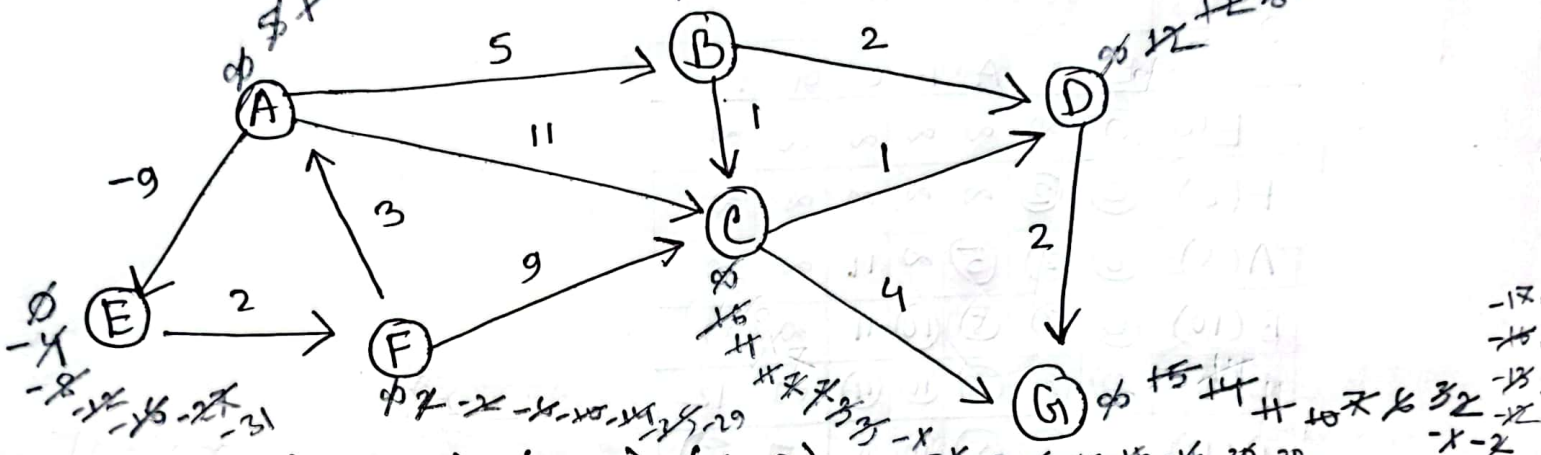
The shortest Path: E → F → A → B → C → D → G

with the cost of : 14

2.

As we have a negative edge (A, E : −9), we have to use Bellman ford algorithm.

$|V| = 7$



(A, E) (E, F) (F, A) (A, B) (A, C) (F, C) (B, C) (B, D) (C, D) (C, G) (D, G)

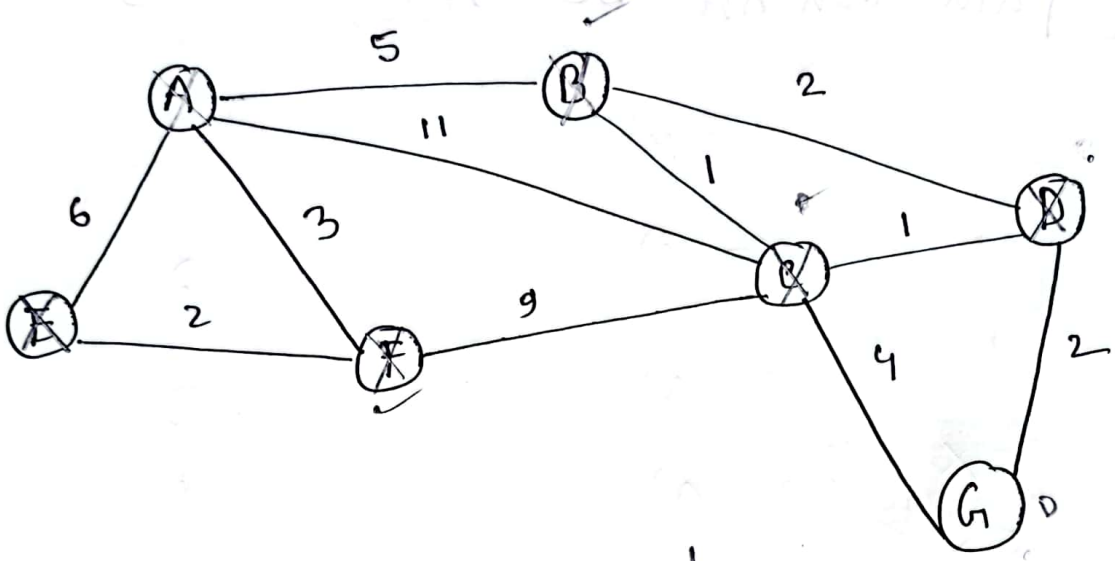
Iteration → / Edge ↓	1	2	3	4	5	6	7
(A, E)	X	−4	−8	−12	−16	−27	−31
(E, F)	2	−2	−6	−10	−14	−25	−29
(F, A)	5	1	−3	−7	−11	−22	−26
(A, B)	10	6	2	−2	−6	−17	−21
(A, C)	16	X	X	X	X	−11	X
(F, C)	11	7	3	−1	−5	−16	−20
(B, C)	11	7	3	−1	−5	−16	−20
(B, D)	12	8	4	0	−4	−15	−19
(C, D)	12	8	4	0	−4	−15	−19
(C, G)	15	11	7	3	−1	−12	−16
(D, G)	14	10	6	2	−2	−13	−17

As, the distance is changing after (|V|-1) or 6 th iteration, there exist a negative cycle.

So, shortest path can not be found in this graph.

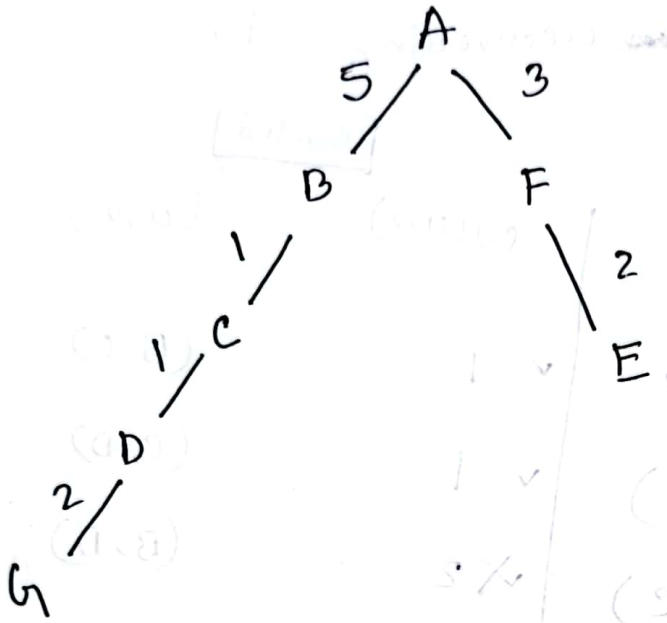
3.

① Prims:



Vertex	Parent	distance	Queue
A	None	0	X
B	A	~~∞~~5	X
C	~~A~~ ~~F~~ B	~~∞~~ ~~4~~ ~~9~~ 1	X
D	~~B~~ C	~~∞~~ ~~2~~ 1	X
E	~~A~~ F	~~∞~~ ~~6~~ 2	X
F	A	~~∞~~ 3	X
G	~~C~~ D	~~∞~~ ~~4~~ 2	X

minimum cost spaning tree:



Total distance: 14

(11) Kruskal's:

Sorted list of edges according to their weight:

Unsorted w(u,v)	Unsorted (u,v)	Sorted w(u,v)	Sorted (u,v)
6	(A, E)	✓ 1	(B, C)
5	(A, B)	✓ 1	(C, D)
11	(A, C)	✗ 2	(B, D)
2	(E, F)	✓ 2	(D, G)
3	(A, F)	✓ 2	(E, F)
9	(F, C)	✓ 3	(A, F)
1	(B, C)	✗ 4	(C, G)
1	(C, D)	✓ 5	(A, B)
4	(C, G)	6	(A, E)
2	(B, D)	9	(F, C)
2	(D, G)	11	(A, C)

$|V| = 7$

$|E| = 11$

$|T| = 6$

Vertex Set:

$\{A\}, \{B\}, \{C\}, \{D\}, \{E\}, \{F\}, \{G\}$

$\Rightarrow \{A\}, \{B, C\}, \{D\}, \{E\}, \{F\}, \{G\}$

$\Rightarrow \{A\}, \{B, C, D\}, \{E\}, \{F\}, \{G\}$

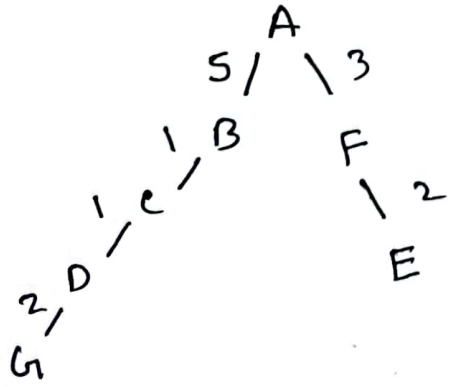
$\Rightarrow \{A\}, \{B, C, D, G\}, \{E\}, \{F\}$

$\Rightarrow \{A\}, \{B, C, D, G\}, \{E, F\}$

$\Rightarrow \{A, E, F\}, \{B, C, D, G\}$

$\Rightarrow \{A, B, C, D, E, F, G\}$

minimum cost spanning tree:



Total cost : 14