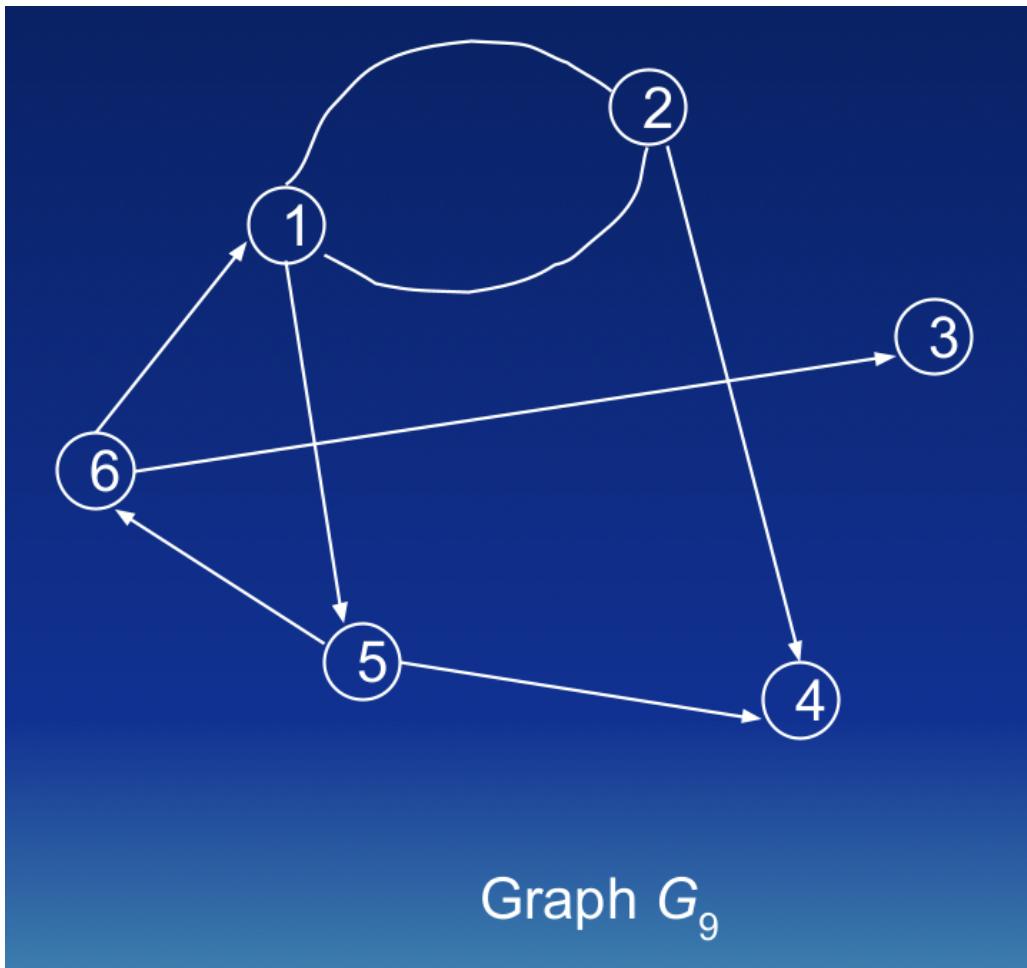


**GRAPHS****FORMAL DESCRIPTION OF GRAPH 9**

$$G9 = (V_9, E_9)$$

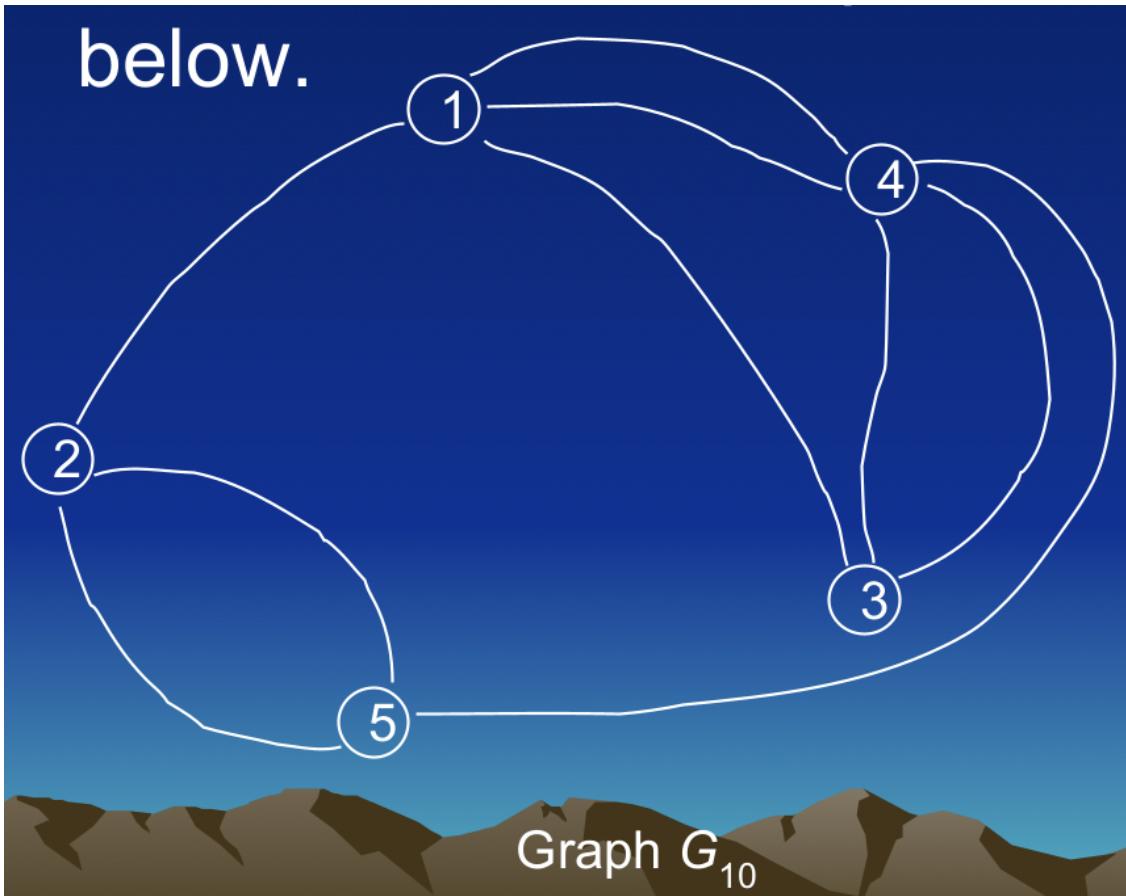
$$V9 = \{1, 2, 3, 4, 5, 6\}$$

$$E9 = \{(1, 2), (1, 5), (2, 1), (2, 4), (5, 4), (5, 6), (6, 3)\}$$

Outdegree of 1 is 2  
Outdegree of 2 is 2  
Outdegree of 3 is 0  
Outdegree of 4 is 0  
Outdegree of 5 is 2  
Outdegree of 6 is 2

Indegree of 1 is 2  
Indegree of 2 is 1  
Indegree of 3 is 1  
Indegree of 4 is 2  
Indegree of 5 is 1  
Indegree of 6 is 1

below.



FORMAL DESCRIPTION OF GRAPH 10

$$G_{10} = (V_{10}, E_{10})$$

$$V_{10} = \{1, 2, 3, 4, 5\}$$

$$E_{10} = \{(1, 4), (2, 1), (2, 5), (3, 1), (3, 4), (4, 1), (4, 3), (4, 5), (5, 2)\}$$

Outdegree of 1 is 1

Outdegree of 2 is 2

Outdegree of 3 is 2

Outdegree of 4 is 3

Outdegree of 5 is 1

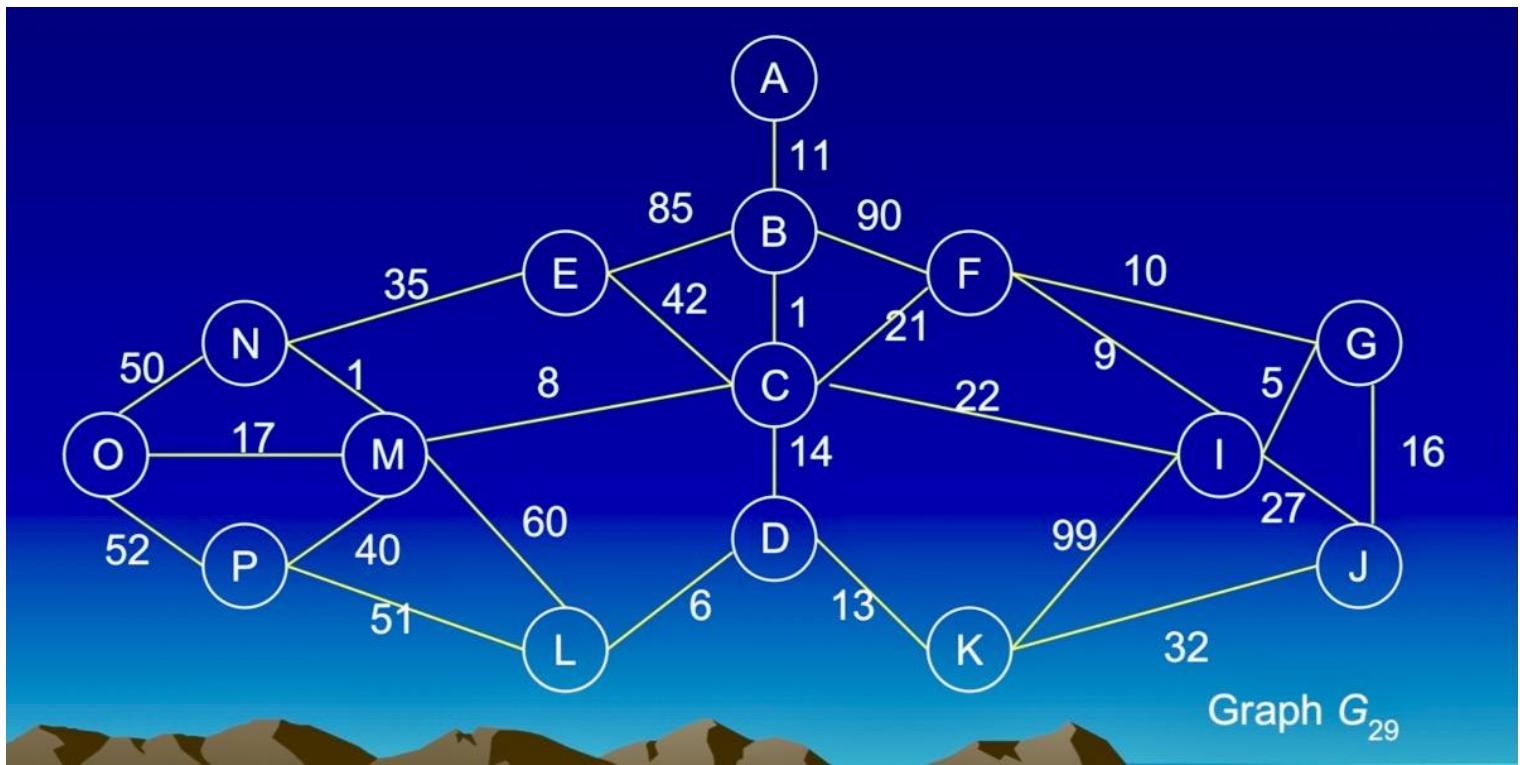
Indegree of 1 is 3

Indegree of 2 is 1

Indegree of 3 is 1

Indegree of 4 is 2

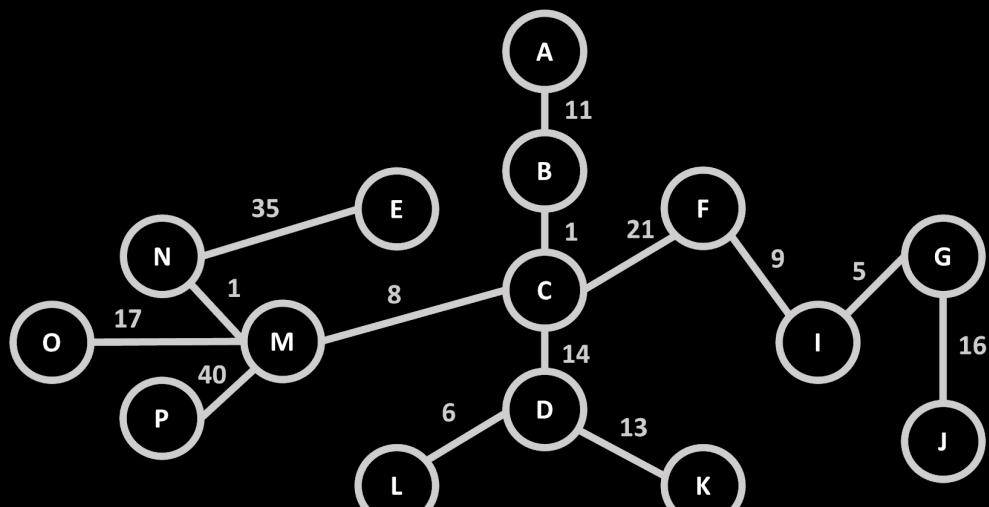
Indegree of 5 is 2



Minimum Spanning Tree Generated Using Kruskal's Algorithm

### KRUSKAL METHOD

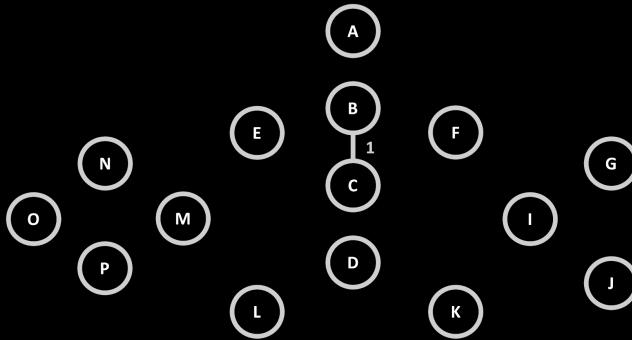
Cost of minimum spanning tree: 197



EDGE	WEIGHT	EDGE	WEIGHT
B , C	1	C , I	22
N , M	1	I , J	27
G , I	5	J , K	32
D , L	6	E , N	35
C , M	8	M , P	40
F , I	9	B , E	42
F , G	10	N , O	50
A , B	11	L , P	51
D , K	13	O , P	52
C , D	14	L , M	60
G , J	16	B , E	85
M , O	17	B , F	90
C , F	21	I , K	99

### Kruskal's Algorithm on Graph 29

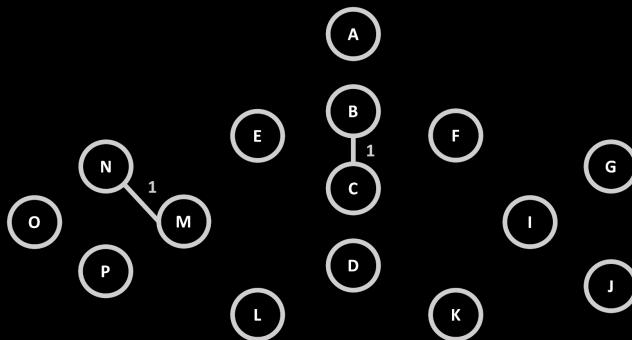
#### KRUSKAL METHOD



EDGE	WEIGHT
B , C	1
C , I	22
N , M	1
I , J	27
G , I	5
J , K	32
D , L	6
E , N	35
C , M	8
M , P	40
F , I	9
B , E	42
F , G	10
N , O	50
A , B	11
L , P	51
D , K	13
O , P	52
C , D	14
L , M	60
G , J	16
B , E	85
M , O	17
B , F	90
C , F	21
I , K	99

EDGE	WEIGHT
B , C	1
C , I	22
N , M	1
I , J	27
G , I	5
J , K	32
D , L	6
E , N	35
C , M	8
M , P	40
F , I	9
B , E	42
F , G	10
N , O	50
A , B	11
L , P	51
D , K	13
O , P	52
C , D	14
L , M	60
G , J	16
B , E	85
M , O	17
B , F	90
C , F	21
I , K	99

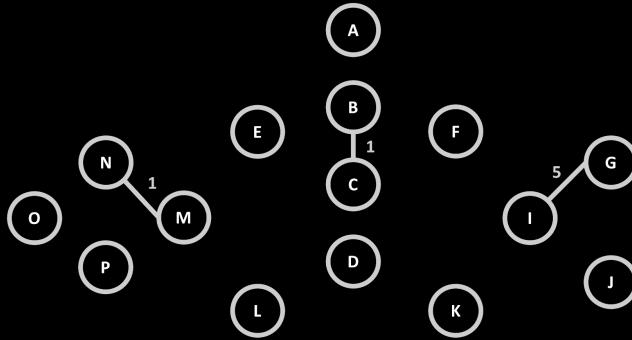
#### KRUSKAL METHOD



EDGE	WEIGHT
B , C	1
C , I	22
N , M	1
I , J	27
G , I	5
J , K	32
D , L	6
E , N	35
C , M	8
M , P	40
F , I	9
B , E	42
F , G	10
N , O	50
A , B	11
L , P	51
D , K	13
O , P	52
C , D	14
L , M	60
G , J	16
B , E	85
M , O	17
B , F	90
C , F	21
I , K	99

EDGE	WEIGHT
B , C	1
C , I	22
N , M	1
I , J	27
G , I	5
J , K	32
D , L	6
E , N	35
C , M	8
M , P	40
F , I	9
B , E	42
F , G	10
N , O	50
A , B	11
L , P	51
D , K	13
O , P	52
C , D	14
L , M	60
G , J	16
B , E	85
M , O	17
B , F	90
C , F	21
I , K	99

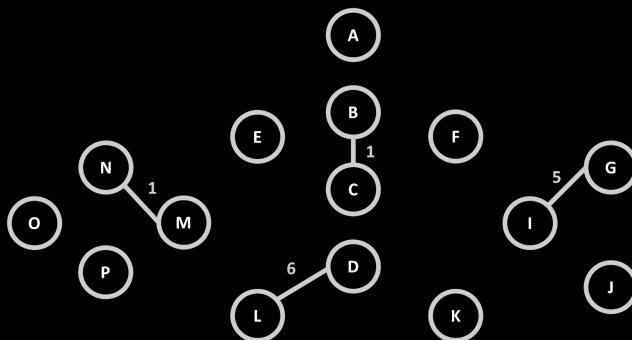
#### KRUSKAL METHOD



EDGE	WEIGHT
B , C	1
C , I	22
N , M	1
I , J	27
G , I	5
J , K	32
D , L	6
E , N	35
C , M	8
M , P	40
F , I	9
B , E	42
F , G	10
N , O	50
A , B	11
L , P	51
D , K	13
O , P	52
C , D	14
L , M	60
G , J	16
B , E	85
M , O	17
B , F	90
C , F	21
I , K	99

EDGE	WEIGHT
B , C	1
C , I	22
N , M	1
I , J	27
G , I	5
J , K	32
D , L	6
E , N	35
C , M	8
M , P	40
F , I	9
B , E	42
F , G	10
N , O	50
A , B	11
L , P	51
D , K	13
O , P	52
C , D	14
L , M	60
G , J	16
B , E	85
M , O	17
B , F	90
C , F	21
I , K	99

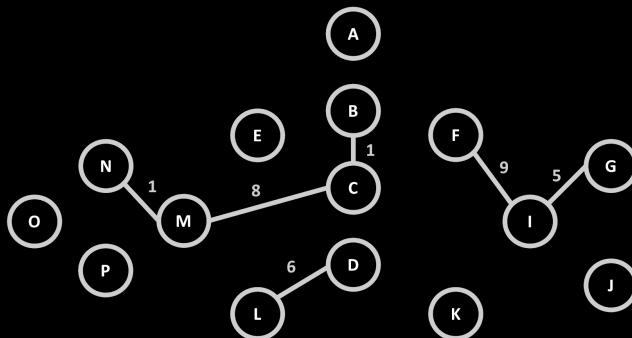
#### KRUSKAL METHOD



EDGE	WEIGHT
B , C	1
C , I	22
N , M	1
I , J	27
G , I	5
J , K	32
D , L	6
E , N	35
C , M	8
M , P	40
F , I	9
B , E	42
F , G	10
N , O	50
A , B	11
L , P	51
D , K	13
O , P	52
C , D	14
L , M	60
G , J	16
B , E	85
M , O	17
B , F	90
C , F	21
I , K	99

EDGE	WEIGHT
B , C	1
C , I	22
N , M	1
I , J	27
G , I	5
J , K	32
D , L	6
E , N	35
C , M	8
M , P	40
F , I	9
B , E	42
F , G	10
N , O	50
A , B	11
L , P	51
D , K	13
O , P	52
C , D	14
L , M	60
G , J	16
B , E	85
M , O	17
B , F	90
C , F	21
I , K	99

### KRUSKAL METHOD



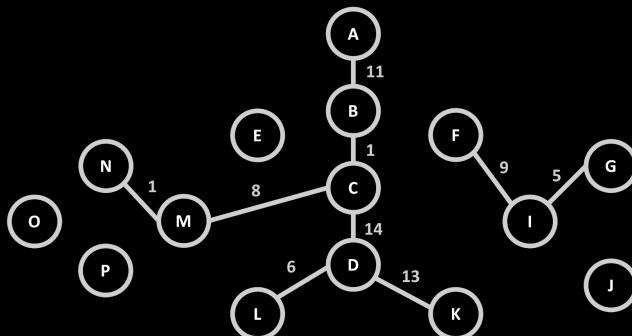
EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
L , P	21
O , P	52
L , M	60
B , E	85
B , F	90
C , F	21
I , K	99

EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
L , P	51
O , P	52
L , M	60
B , E	85
B , F	90
C , F	21
I , K	99

EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
L , P	51
O , P	52
L , M	60
B , E	85
B , F	90
C , F	21
I , K	99

EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
L , P	51
O , P	52
L , M	60
B , E	85
B , F	90
C , F	21
I , K	99

### KRUSKAL METHOD



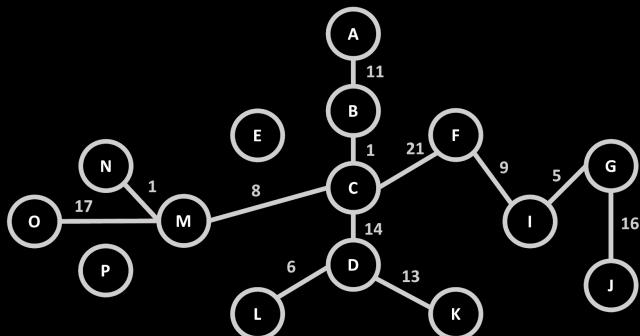
EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
<b>F , G</b>	<b>10</b>
A , B	11
M , O	17
L , P	51
O , P	52
C , D	14
G , J	16
M , O	17
B , E	85
B , F	90
C , F	21
I , K	99

EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
<b>F , G</b>	<b>10</b>
A , B	11
M , O	17
L , P	51
O , P	52
C , D	14
G , J	16
M , O	17
B , E	85
B , F	90
C , F	21
I , K	99

EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
<b>F , G</b>	<b>10</b>
A , B	11
M , O	17
L , P	51
O , P	52
C , D	14
G , J	16
M , O	17
B , E	85
B , F	90
C , F	21
I , K	99

EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
<b>F , G</b>	<b>10</b>
A , B	11
M , O	17
L , P	51
O , P	52
C , D	14
G , J	16
M , O	17
B , E	85
B , F	90
C , F	21
I , K	99

### KRUSKAL METHOD



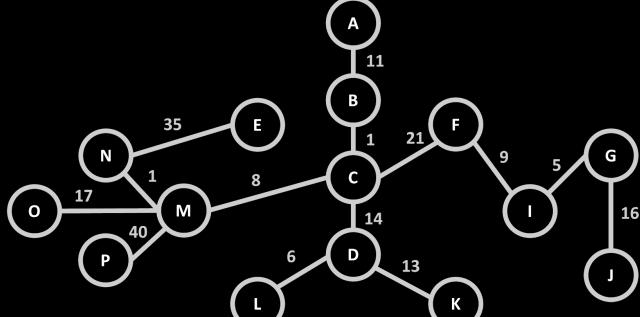
EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
<b>F , G</b>	<b>10</b>
A , B	11
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
C , D	14
G , J	16
M , O	17
B , F	90
C , F	21

EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
<b>F , G</b>	<b>10</b>
A , B	11
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
C , D	14
G , J	16
M , O	17
B , F	90
C , F	21

EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
<b>F , G</b>	<b>10</b>
A , B	11
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
C , D	14
G , J	16
M , O	17
B , F	90
C , F	21

EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
<b>F , G</b>	<b>10</b>
A , B	11
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
C , D	14
G , J	16
M , O	17
B , F	90
C , F	21

### KRUSKAL METHOD



EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
<b>F , G</b>	<b>10</b>
A , B	11
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
C , D	14
G , J	16
M , O	17
B , F	90
C , F	21

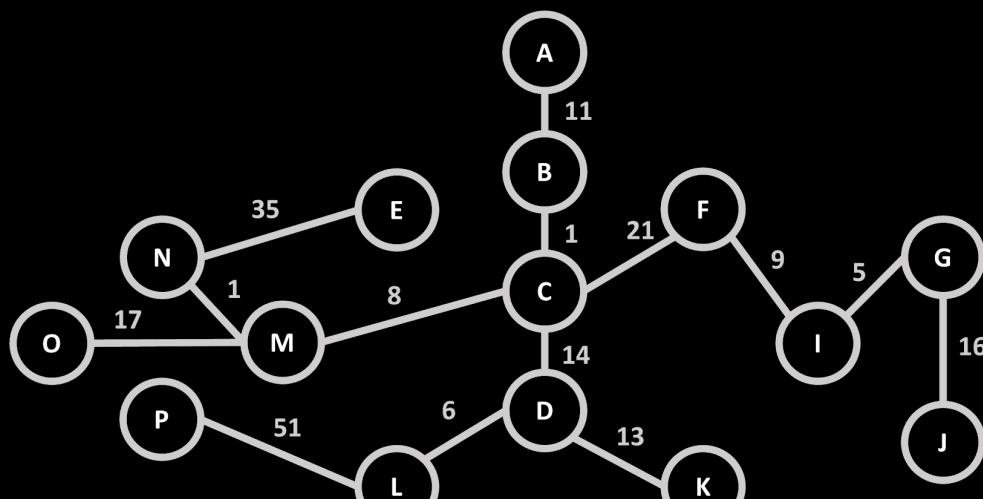
EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
<b>F , G</b>	<b>10</b>
A , B	11
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
C , D	14
G , J	16
M , O	17
B , F	90
C , F	21

EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
<b>F , G</b>	<b>10</b>
A , B	11
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
C , D	14
G , J	16
M , O	17
B , F	90
C , F	21

## Minimum Spanning Tree Generated Using Prim's Algorithm Starting with Vertex E

### PRIMS METHOD

Cost of minimum spanning tree: 208

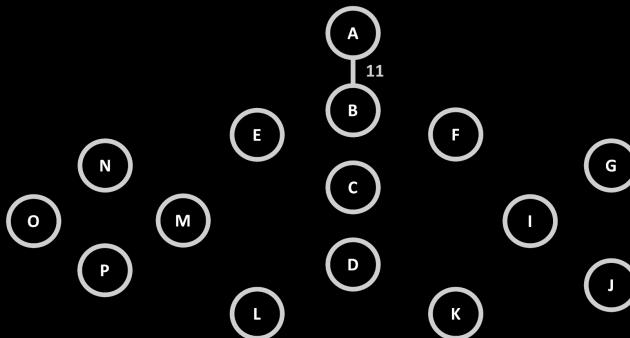


EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
B , F	90
C , F	21
E , N	35
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
L , M	60
B , E	85
I , K	99

EDGE	WEIGHT
B , C	1
C , I	22
I , J	27
J , K	32
E , N	35
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
L , M	60
B , E	85
M , O	17
B , F	90
I , K	99

### Prim's Algorithm on Graph 29

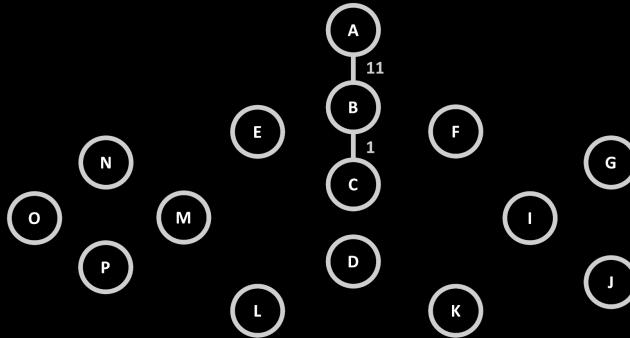
#### PRIMS METHOD



EDGE	WEIGHT
B , C	1
C , I	22
I , J	27
J , K	32
E , N	35
M , P	40
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
C , F	21
O , P	52
L , M	60
B , E	85
B , F	90
I , K	99

EDGE	WEIGHT
B , C	1
C , I	22
I , J	27
J , K	32
E , N	35
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
L , M	60
B , E	85
M , O	17
B , F	90
I , K	99

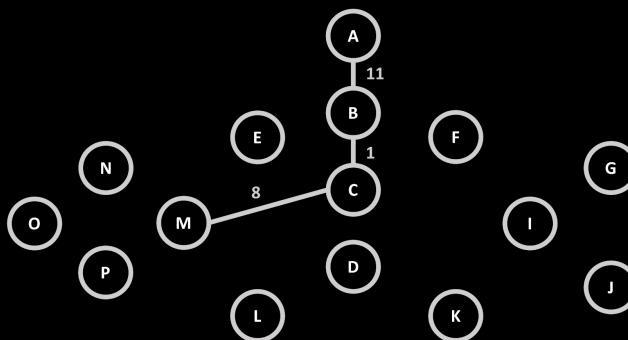
#### PRIMS METHOD



EDGE	WEIGHT
B , C	1
C , I	22
I , J	27
J , K	32
E , N	35
M , P	40
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
C , F	21
O , P	52
L , M	60
B , E	85
B , F	90
I , K	99

EDGE	WEIGHT
B , C	1
C , I	22
I , J	27
J , K	32
E , N	35
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
L , M	60
B , E	85
M , O	17
B , F	90
I , K	99

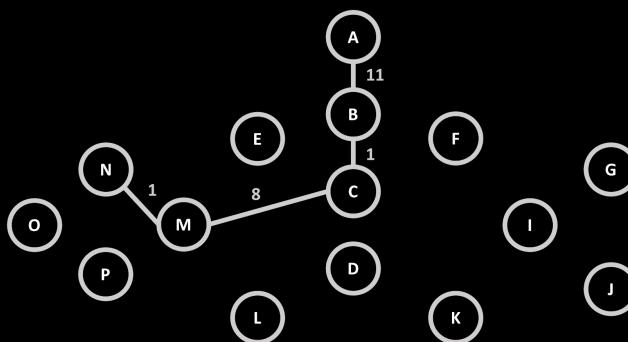
### PRIMS METHOD



EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
C , F	21

EDGE	WEIGHT
C , I	22
I , J	27
J , K	32
E , N	35
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
L , M	60
B , E	85
B , F	90
I , K	99

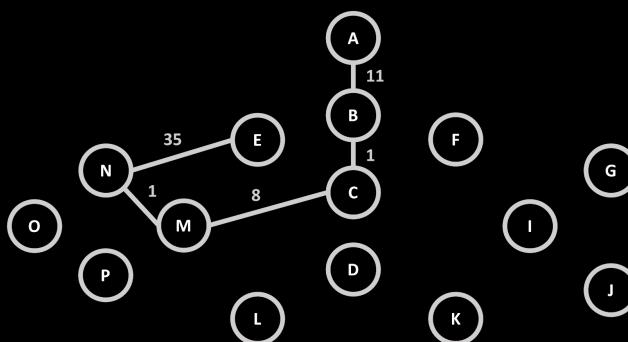
### PRIMS METHOD



EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
C , F	21

EDGE	WEIGHT
C , I	22
I , J	27
J , K	32
E , N	35
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
L , M	60
B , E	85
B , F	90
I , K	99

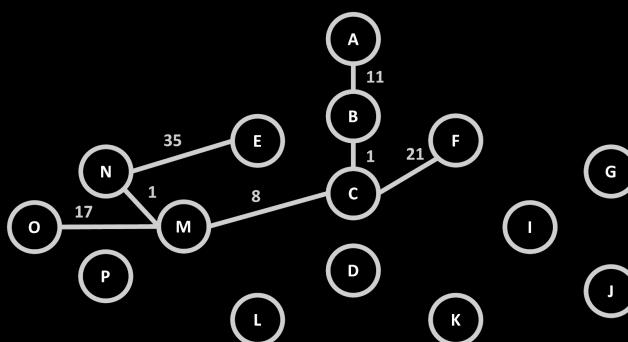
### PRIMS METHOD



EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
C , F	21

EDGE	WEIGHT
C , I	22
I , J	27
J , K	32
E , N	35
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
L , M	60
B , E	85
B , F	90
I , K	99

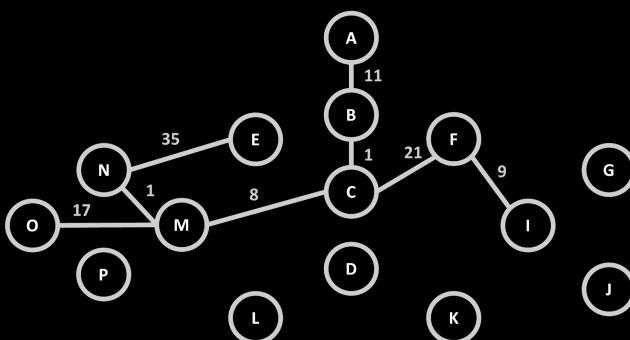
### PRIMS METHOD



EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
C , F	21

EDGE	WEIGHT
C , I	22
I , J	27
J , K	32
E , N	35
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
L , M	60
B , E	85
B , F	90
I , K	99

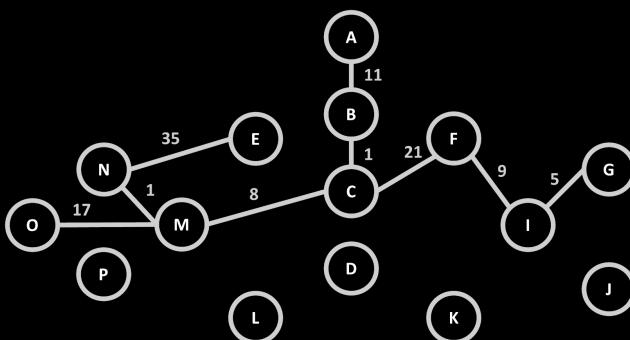
### PRIMS METHOD



EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
C , F	21

EDGE	WEIGHT
C , I	22
I , J	27
J , K	32
E , N	35
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
L , M	60
B , E	85
B , F	90
I , K	99

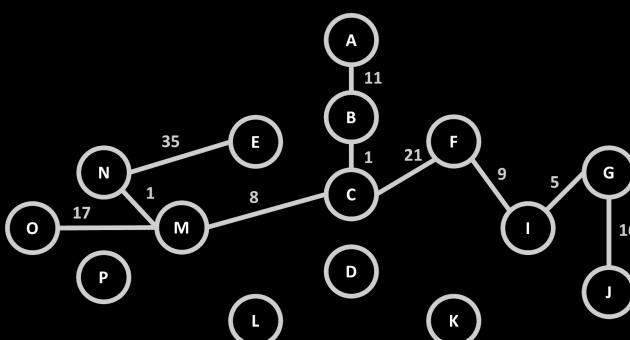
### PRIMS METHOD



EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
C , F	21

EDGE	WEIGHT
C , I	22
I , J	27
J , K	32
E , N	35
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
L , M	60
B , E	85
B , F	90
I , K	99

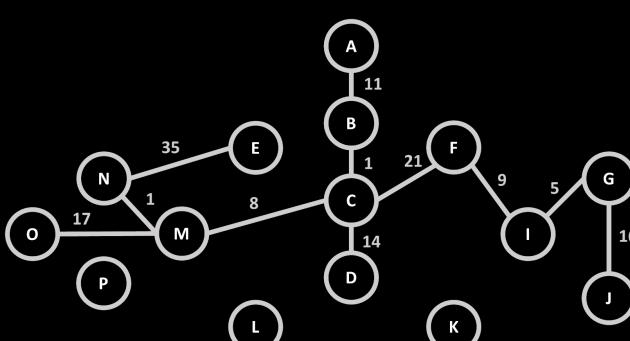
### PRIMS METHOD



EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
G , J	16
M , O	17
C , F	21

EDGE	WEIGHT
C , I	22
I , J	27
J , K	32
E , N	35
M , P	40
B , E	42
N , O	50
L , P	51
O , P	52
L , M	60
B , E	85
B , F	90
I , K	99

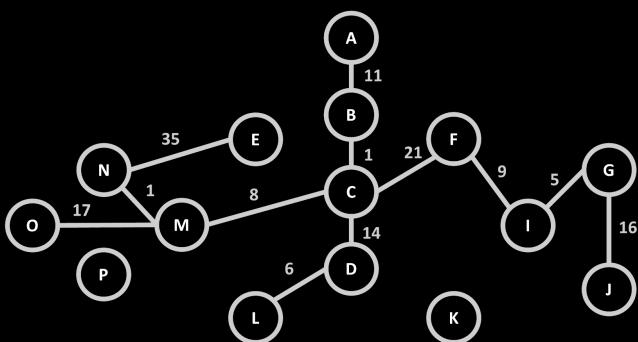
### PRIMS METHOD



EDGE	WEIGHT
B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
F , I	9
F , G	10
A , B	11
D , K	13
C , D	14
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C , I	22
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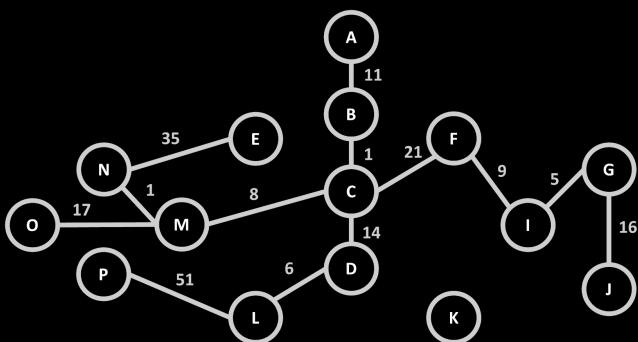
## PRIMS METHOD



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B , C	1
N , M	1
G , I	5
D , L	6
C , M	8
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F , G	10
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B , F	90
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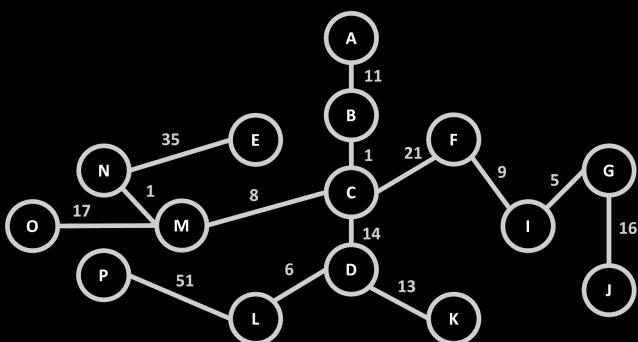
## PRIMS METHOD



EDGE	WEIGHT
B , C	1
N , M	1
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D , L	6
C , M	8
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F , G	10
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## PRIMS METHOD



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