

Problem 1 solved using code



The screenshot shows a software window titled "Transmission Simulation". It contains input fields for "Enter number of Nodes: 6" and "Enter number of Edges: 8", both with "Accept" buttons. Below these are several tables for entering node and edge data. The "Enter Name of Nodes" table lists nodes a through f. The "Enter Start Node", "Enter End Node", "Enter Source Node", "Enter Dest Node", and "Enter Edge Weight" tables contain the following data:

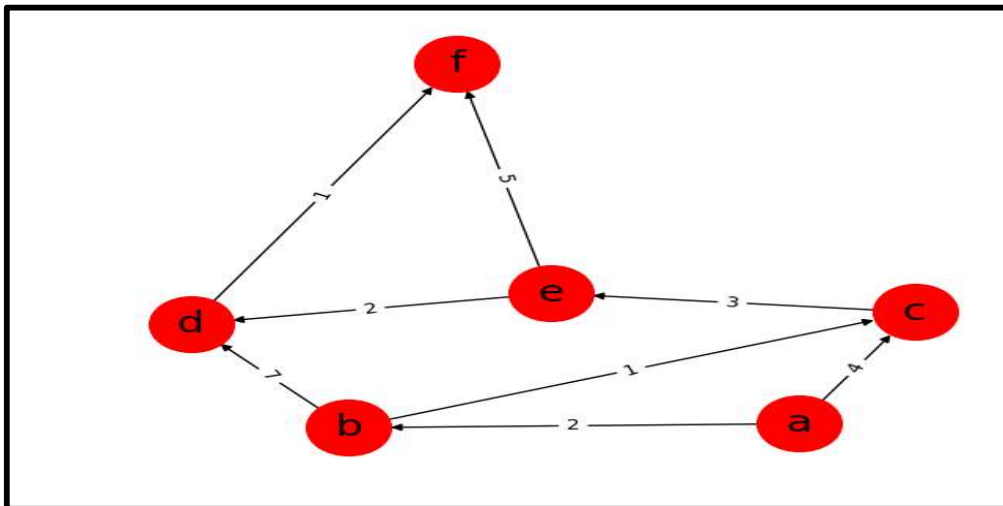
Enter Start Node	Enter End Node	Enter Source Node	Enter Dest Node	Enter Edge Weight
a	b	a	b	2
b	c	a	c	4
c	d	b	c	1
d	e	b	d	7
e	f	c	e	3
f	d	c	d	2
		e	f	5
		d	f	1

Buttons for "Accept Nodes" and "Accept Data" are also visible.

Shortest Path Using Dijkstra's Algorithm

By - Adolf Anthony D'costa
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Sannithi Vinod Kumar

Graph 1 plotted by the program



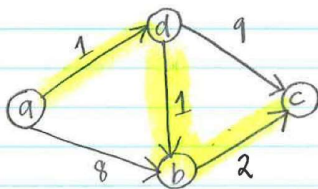
Result 1 from the program

```
1 C:\Users\Adolf\AppData\Local\Programs\Python\Python37-32\python.exe "C:/Users/Adolf/Desktop/Maths Project/Maths Project.py"
2 [{"path": ['a', 'b', 'c', 'e', 'd', 'f'], 'weight': 9}, {"path": ['a', 'b', 'c', 'e', 'f'], 'weight': 11}, {"path": ['a', 'b', 'd', 'f'], 'weight': 10}, {"path": ['a', 'c', 'e', 'd', 'f'], 'weight': 10}, {"path": ['a', 'c', 'e', 'f'], 'weight': 12}]
```

PRACTICAL EXAMPLE 2

THEORETICALLY EXPLAINED

②



Start node — 'a' End node — 'c'

Shortest path — $a \rightarrow d \rightarrow b \rightarrow c$

The cost of it is 4 units

Problem 2 solved using code

Transmission Simulation

Enter number of Nodes: 4

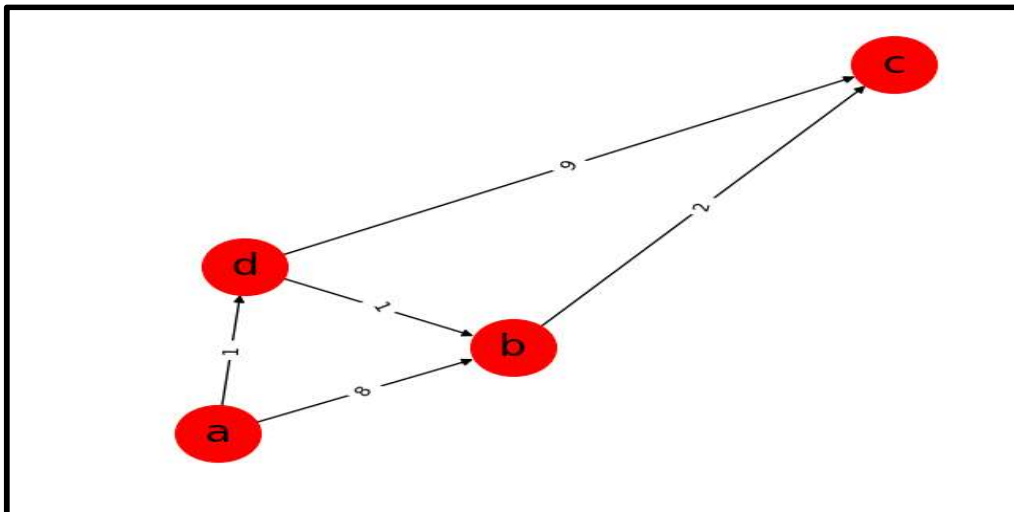
Enter number of Edges: 5

Enter Name of Nodes	Enter Start Node	Enter Source Node	Enter Dest Node	Enter Edge Weight
a	a	a	d	1
b	b	a	b	8
c	c	d	b	1
d	d	d	c	9
b	b	b	c	2

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Graph 2 plotted by the program



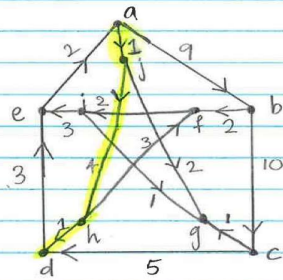
Result 2 from the program

```
1 C:\Users\Adolf\AppData\Local\Programs\Python\Python37-32\python.exe "C:/Users/Adolf/Desktop/Maths Project/Maths Project.py"
2 [{"path": ['a', 'd', 'b', 'c'], 'weight': 4}, {'path': ['a', 'd', 'c'], 'weight': 10}, {'path': ['a', 'b', 'c'], 'weight': 10}]
```

PRACTICAL EXAMPLE 3

THEORETICALLY EXPLAINED

③



Start node - 'a' End node - 'd'

Shortest path $a \xrightarrow{1} j \xrightarrow{4} h \xrightarrow{1} d$

The cost of it is '6' units

Transmission Simulation
Enter number of Nodes: 10
Enter number of Edges: 15
Accept

Enter Name of Nodes	Enter Start Node	Enter Source Node	Enter Dest Node	Enter Edge Weight
a	a	a	b	9
b	Enter End Node	b	c	10
c	d	c	d	5
d		d	e	3
e		e	a	2
f		a	j	1
g		b	f	2
h		c	g	1
i		h	d	1
j		i	e	3
		j	h	4
		f		2
		h	f	3
		g		1
		g	g	4

Accept Nodes

Accept Data

Shortest Path Using Dijkstra's Algorithm

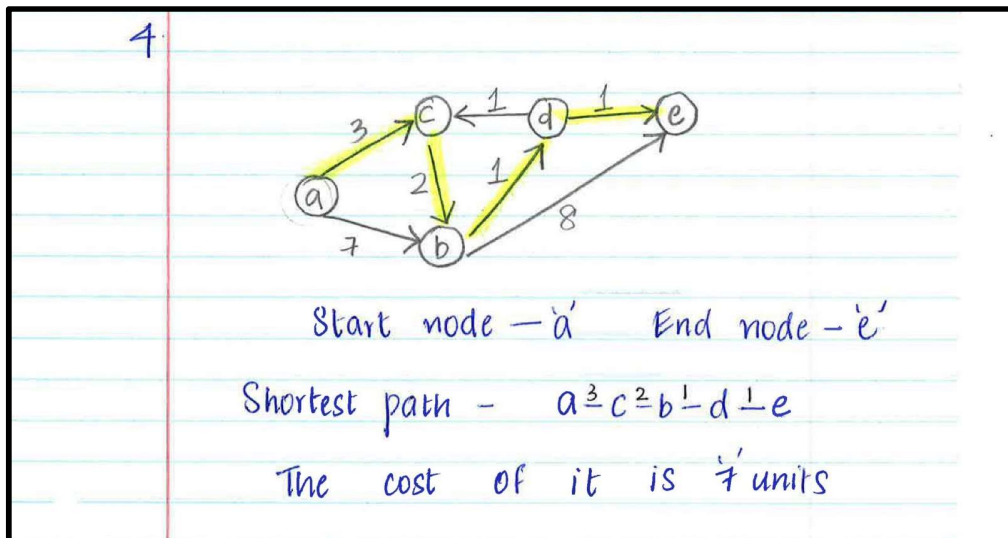
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Result 3 from the program

```
C:\Users\Adolf\AppData\Local\Programs\Python\Python37-32\python.exe "C:/Users/Adolf/Desktop/Maths Project/Maths Project.py"
[{'path': ['a', 'b', 'c', 'd'], 'weight': 24}, {'path': ['a', 'j', 'h', 'd'], 'weight': 6}]
```

PRACTICAL EXAMPLE 4

THEORETICALLY EXPLAINED



Problem 4 solved using code

Transmission Simulation

Enter number of Nodes: 5 Enter Name of Nodes Enter Start Node Enter Source Node Enter Dest Node Enter Edge Weight

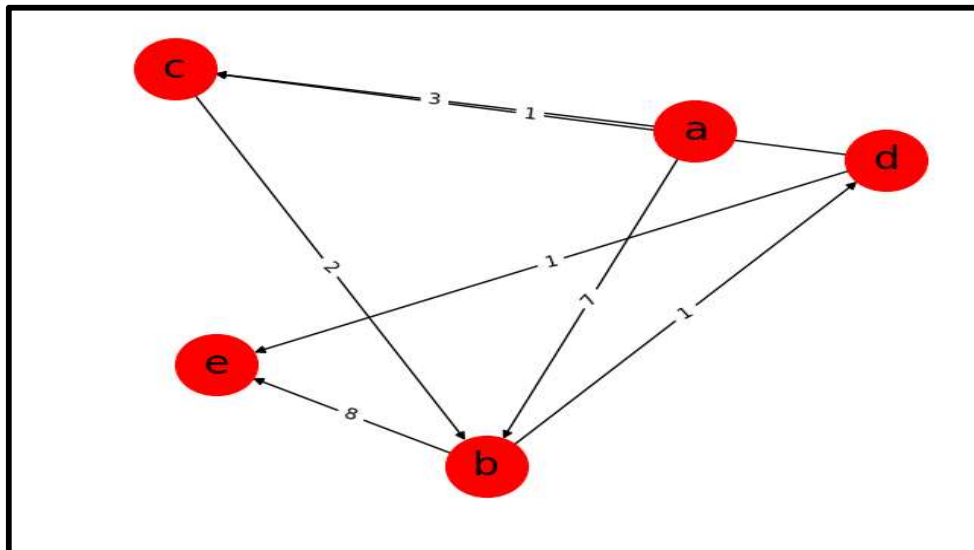
Enter number of Edges: 7

Enter Name of Nodes	Enter Start Node	Enter Source Node	Enter Dest Node	Enter Edge Weight
a	a	a	c	3
b	b	a	b	7
c	c	c	b	2
d	d	d	c	1
e	e	b	d	1
		b	e	8
		d	e	1

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Graph 4 plotted by the program



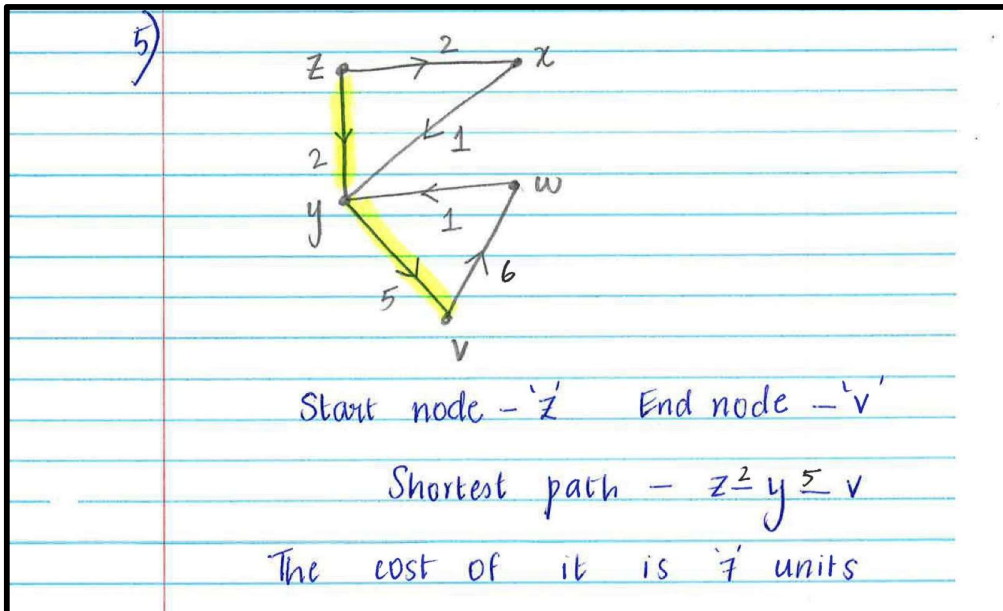
Result 4 from the program

```
C:\Users\Adolf\AppData\Local\Programs\Python\Python37-32\python.exe "C:/Users/Adolf/Desktop/Maths Project/Maths Project.py"
```

```
[{'path': ['a', 'c', 'b', 'd', 'e'], 'weight': 7}, {'path': ['a', 'c', 'b', 'e'], 'weight': 13}, {'path': ['a', 'b', 'd', 'e'], 'weight': 9}, {'path': ['a', 'b', 'e'], 'weight': 15}]
```

PRACTICAL EXAMPLE 5

THEORETICALLY EXPLAINED



Problem 5 solved using code

Transmission Simulation

Enter number of Nodes: 5 Enter Name of Nodes Enter Start Node Enter Source Node Enter Dest Node Enter Edge Weight

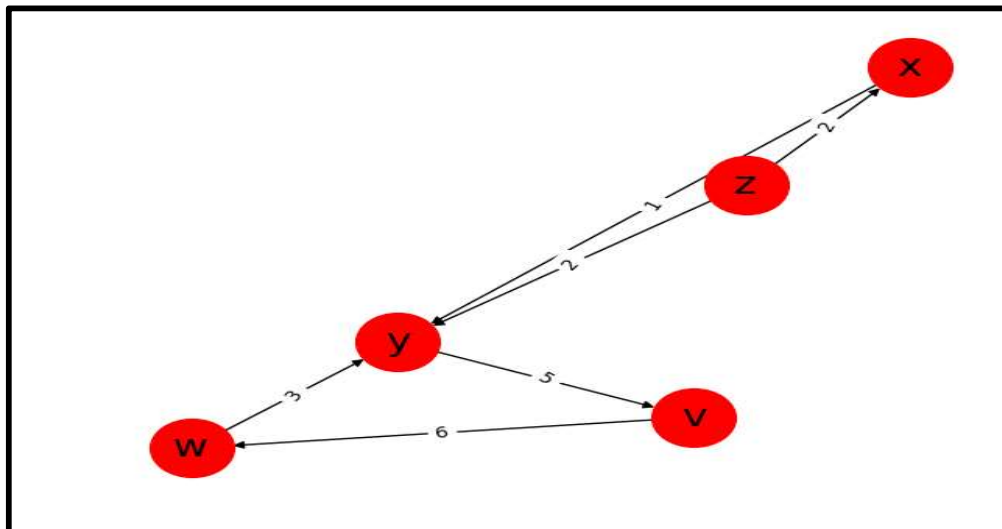
Enter number of Edges: 6

Enter Name of Nodes	Enter Start Node	Enter Source Node	Enter Dest Node	Enter Edge Weight
z	z	z	x	2
x		z	y	2
y		x	y	1
w		y	v	5
v		w	y	3
		v	w	4

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Graph 5 plotted by the program



Result 5 from the program

```
C:\Users\Adolf\AppData\Local\Programs\Python\Python37-32\python.exe "C:/Users/Adolf/Desktop/Maths Project/Maths Project.py"  
[{'path': ['z', 'x', 'y', 'v'], 'weight': 8}, {'path': ['z', 'y', 'v'], 'weight': 7}]
```