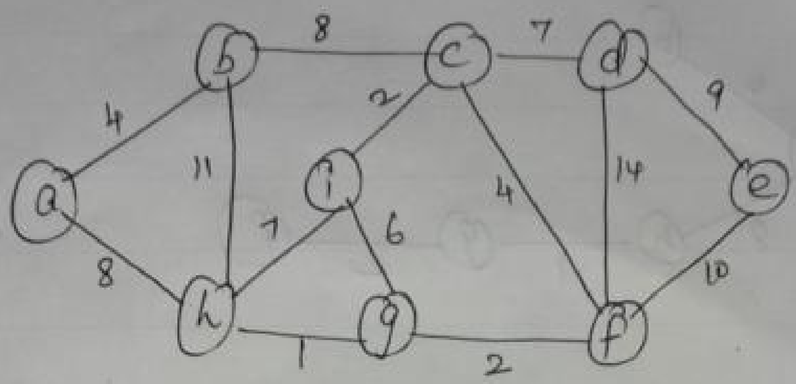
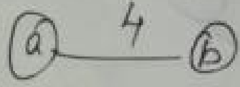
Part B.

13 ii)

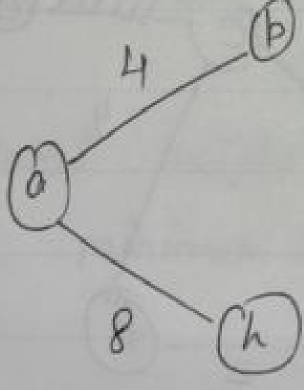


Step 1

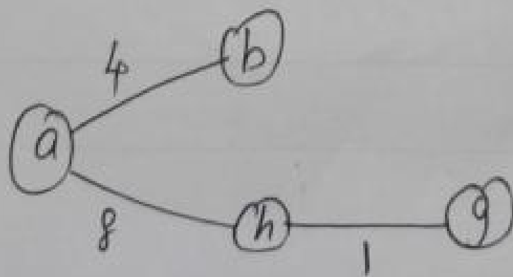
Starting edge 

find adjacent vertices which is having least weight

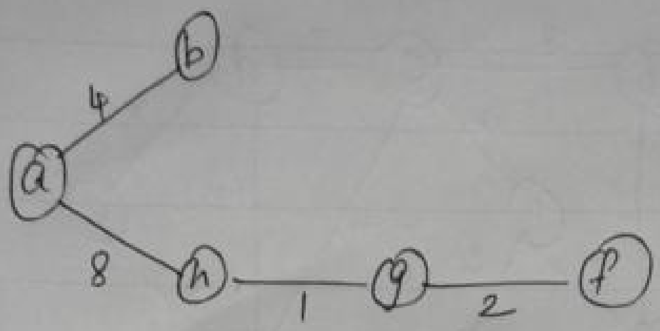
Step 2



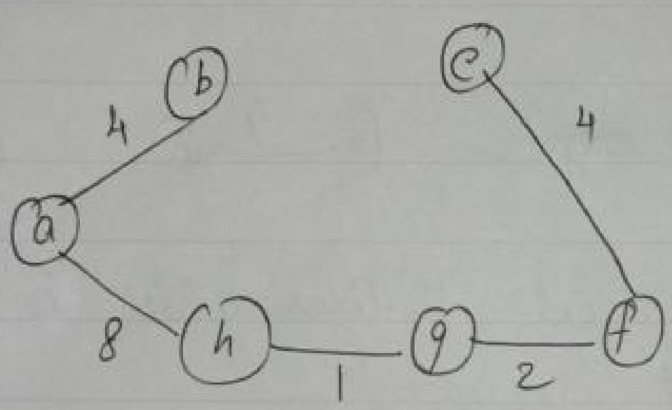
Step 3



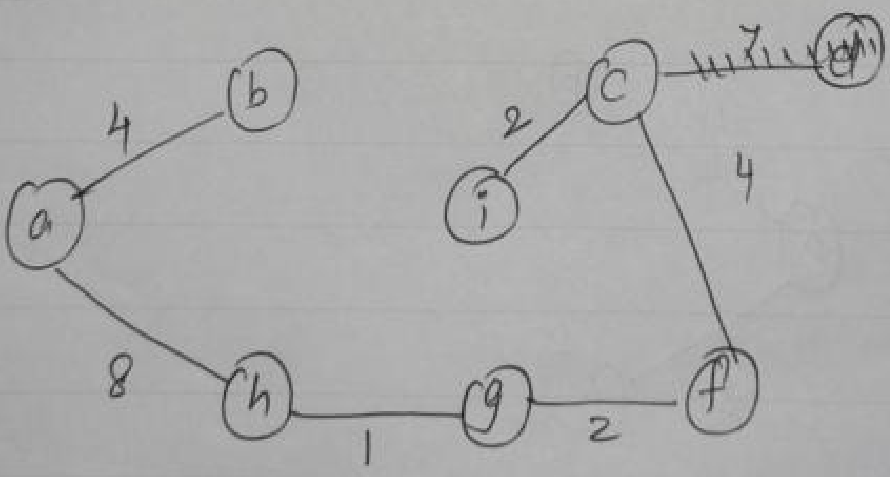
Step 4



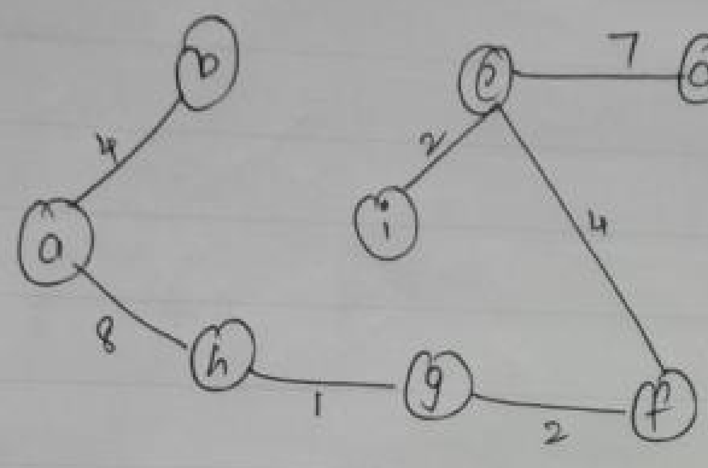
Step 5



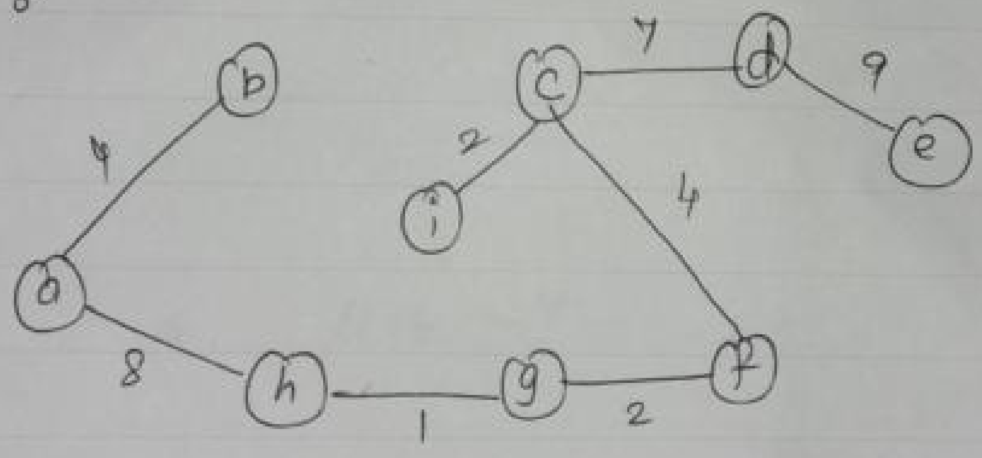
Step 6



Step 7



Step 8



Total weight of the minimum spanning tree $\Big\} = 4+8+1+2+4+2+7+9$

$= 37.$

14)

obj	1	2	3	4	5
profit	10	12	20	22	40
weight	2	3	4	5	7
P/w	5	4	5	4.4	5.71

x_i	P/w	obj	wt	Remaining sack weight
$x_5=1$	5.71	5	7	$20-7=13$
$x_1=1$	5	1	2	$13-2=11$
$x_3=1$	5	3	4	$11-4=7$
$x_4=1$	4.4	4	5	$7-5=2$
$x_2=2/3$	4	2	2/3	$2-2=0$

$$\sum x_i w_i = 1\times 2 + \frac{2}{3}\times 3 + 1\times 4 + 1\times 5 + 1\times 7$$

$$= 2+2+4+5+7$$

$$= 20$$

$$\therefore \boxed{\sum x_i w_i = 20\text{ kg}}$$

$$\Sigma x_i p_i = 1 \times 10 + \frac{2}{3} \times 12 + 1 \times 20 + 1 \times 22 + 1 \times 40$$

$$= 10 + 8 + 20 + 22 + 40$$

$$= 100$$

$$\boxed{\therefore \Sigma x_i p_i = 100}$$

15 OBST

keys	Mouse	Keyboard	Memory	cpu
probability	$p1 = 2/7$	$p2 = 1/7$	$p3 = 3/7$	$p_4 = 1/7$

$c_{1,1} = p_1 = 2/7$

$c_{2,2} = p_2 = 1/7$

$c_{3,3} = p_3 = 3/7$

$c_{4,4} = p_4 = 1/7$

	0	1	2	3	4
1	0	2/7			
2		0	4/7		
3			0	3/7	
4				0	1/7
5					0

Compute super diagonal $c[1,2]$

$$c[1,2] = \min \begin{cases} c[1,0] + c[2,2] + p_1 + p_2 & \text{when } k=1 \\ c[1,1] + c[3,2] + p_1 + p_2 & \text{when } k=2 \end{cases}$$

$$= \min \{ 0 + 1/7 + 3/7,\ 2/7 + 0 + 3/7 \}$$

$$= \min \{ 4/7,\ 5/7 \} = 4/7$$

Minimum is when $k=1$

$$c[2,3] = \min \begin{cases} c[2,1] + c[3,3] + p_1 + p_3 & \text{when } k=2 \\ c[2,2] + c[4,3] + p_1 + p_3 & \text{when } k=3 \end{cases}$$

$$= \min \{ 0 + 3/7 + (1/7 + 3/7),\ 1/7 + 0 + (1/7 + 3/7) \}$$

$= \min\{8/7,\ 5/7\} = 5/7$ Minimum when $k=3$.

$$c[3,4] = \min \begin{cases} c[3,2] + c[4,4] + p_3 + p_4 & \text{when } k=3 \\ c[3,3] + c[5,4] + p_3 + p_4 & \text{when } k=4 \end{cases}$$

$$= \min\{0 + 1/7 + (3/7 + 1/7),\ 3/7 + 0 + (3/7 + 1/7)\}$$

$= \min\{5/7,\ 1\} = 5/7$ Minimum when $k=3$

	0	1	2	3	4
1	0	2/7	4/7		
2		0	1/7	5/7	
3			0	3/7	5/7
4				0	1/7
5					0

$$c[1,3] = \min \begin{cases} c[1,0] + c[2,3] + p_1 + p_2 + p_3 & \text{when } i=1, j=3, k=1 \\ c[1,1] + c[3,3] + p_1 + p_2 + p_3 & \text{when } i=1, j=3, k=2 \\ c[1,2] + c[4,3] + p_1 + p_2 + p_3 & \text{when } i=1, j=3, k=3 \end{cases}$$

$$= \min\{0 + 5/7 + (2/7 + 1/7 + 3/7),\ 2/7 + 3/7 + (2/7 + 1/7 + 3/7),\ 4/7 + 0 + (2/7 + 1/7 + 3/7)\}$$

$= \min\{11/7,\ 11/7,\ 10/7\}$

$= 10/7$ when $k = 3$

$$e[2,4] = \min \begin{cases} e[2,3] + c[5,4] + p_2 + p_3 + p_4 & \text{when } k=2 \\ e[2,2] + c[4,4] + p_2 + p_3 + p_4 & \text{when } k=3 \\ e[2,3] + e[5,4] + p_2 + p_3 + p_4 & \text{when } k=4 \end{cases}$$

$$= \min \left\{ 5/7 + 0 + (1/7 + 3/7 + 1/7),\ 1/7 + 1/7 + (1/7 + 3/7 + 1/7),\ 6/7 + 0 + (1/7 + 3/7 + 1/7) \right\}$$

$$= \min \left\{ 10/7,\ 7/7,\ 11/7 \right\} = 7/7 \quad \text{minimum when } k=2$$

	0	1	2	3	4
1	0	2/7	4/7	9/7	
2		0	1/7	5/7	7/7
3			0	3/7	6/7
4				0	2/7
5					0

$$e[1,4] = \min \begin{cases} e[1,0] + c[2,4] + p_1 + p_2 + p_3 + p_4, & k=1 \\ e[1,1] + c[3,4] + p_1 + p_2 + p_3 + p_4 & \text{when } k=2 \\ e[1,2] + c[4,4] + p_1 + p_2 + p_3 + p_4 & \text{when } k=3 \\ e[1,3] + e[4,4] + p_1 + p_2 + p_3 + p_4 & \text{when } k=4 \end{cases}$$

$$= \min \left\{ 0 + 7/7 + (7/7),\ 2/7 + 5/7 + (7/7),\ 4/7 + 1/7 + (7/7),\ 10/7 + 1/7 + (7/7) \right\}$$

$$= \min \left\{ 14/7,\ 14/7,\ 12/7,\ 18/7 \right\} = 12/7$$

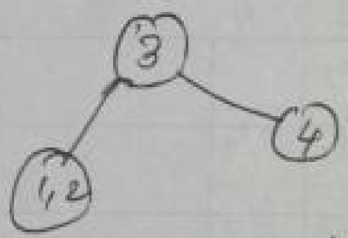
when $k=3$

	0	1	2	3	4
1	0	2/7	4/7	10/7	12/7
2		0	1/7	5/7	7/7
3			0	3/7	7/7
4				0	1/7
5					0

	0	1	2	3	4
1	0	1	1	3	3
2		0	2	3	3
3			0	3	3
4				0	4
5					0

Examine $R(1,4) = 3$. 3 forms root.

4th item forms right children



$R(1,2) = 1$, 1th forms root