

## Question 1

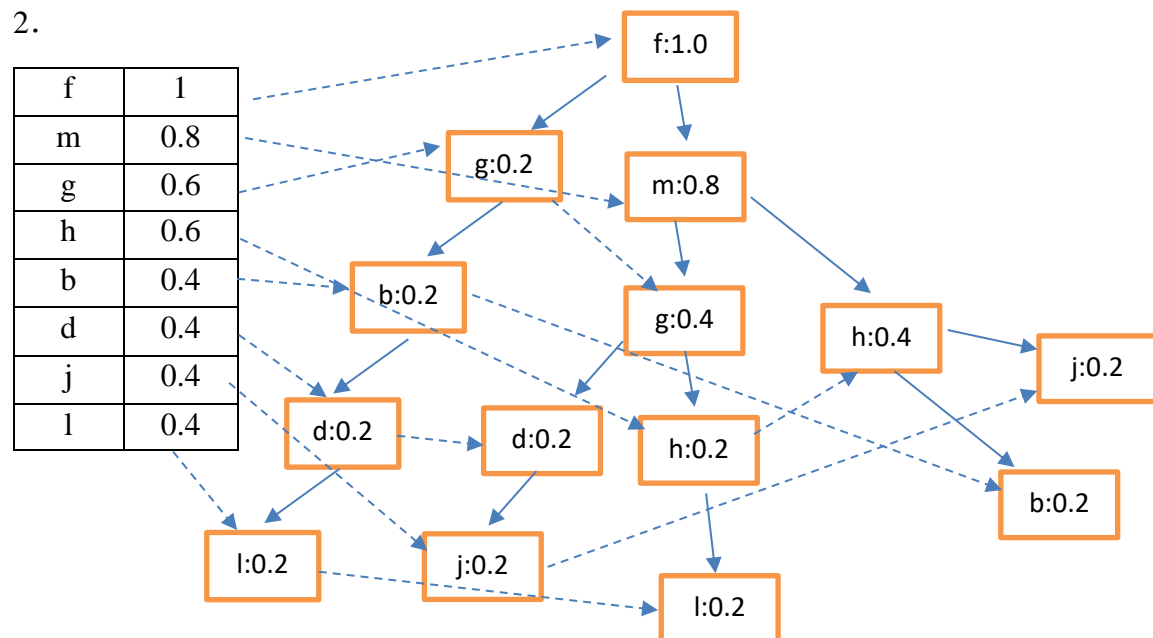
1.

Relative support:  $\text{sup}(a)=0.2$ ,  $\text{sup}(b)=0.4$ ,  $\text{sup}(d)=0.4$ ,  $\text{sup}(f)=1.0$ ,  $\text{sup}(g)=0.6$ ,  $\text{sup}(h)=0.6$ ,  $\text{sup}(j)=0.4$ ,  $\text{sup}(k)=0.2$ ,  $\text{sup}(l)=0.4$ ,  $\text{sup}(m)=0.8$ ,  $\text{sup}(n)=0.2$ .

Support of a, k, n is smaller than minimum support, which are removed.

Transaction ID	Items
1	f g b d l
2	f m g h l
3	f m h b
4	f m h j
5	f m g d j

2.



3.

Item	Conditional Pattern Base	Conditional FP-tree	Frequent Pattern
m	{f:0.8}	<f:0.8>	{f, m:0.8}
h	{f,m:0.4},{f,m,g:0.2}	<f:0.6,m:0.6>	{f,h:0.6},{m,h:0.6}, {f,m,h:0.6}
b	{f,g:0.2},{f,m,h:0.2}	<f:0.4>	{f,b:0.4}
j	{f,m,g,d:0.2} {f,m,h:0.2}	<f:0.4, m:0.4>	{f,j:0.4},{m,j:0.4}, {f,m,j:0.4}

4.

For more frequent pattern, it should have more possibilities to be shared. In this way, we can construct its conditional pattern base, then its conditional FP tree.

5.

Closed: {f, m}, {f, b}, {f, m, h}, {f, m, j}.

Maximal: {f, b}, {f, m, h}, {f, m, j}.

6.

$$f \text{ m} \rightarrow h = 0.6/0.8 = 0.75$$

$$f \text{ j} \rightarrow m = 0.4/0.4 = 1$$