**Question 1**

1.

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

f:1.0

|  |  |
| --- | --- |
| f | 1 |
| m | 0.8 |
| g | 0.6 |
| h | 0.6 |
| b | 0.4 |
| d | 0.4 |
| j | 0.4 |
| l | 0.4 |

d:0.2

d:0.2

b:0.2

g:0.2

h:0.2

g:0.4

h:0.4

m:0.8

b:0.2

j:0.2

j:0.2

l:0.2

l:0.2

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 m->h = 0.6/0.8=0.75

f j->m = 0.4/0.4=1