Ans-1

a) Compute the support for itemsets $\{d\}, \{a,b\}$ and $\{b,d,e\}$

$$\text{Sup } \{d\} = 5$$
$$\text{Sup } \{a,b\} = 4$$
$$\text{Sup } \{b,d,e\} = 1$$

b) Compute the Confidence of $\{b,d\} \Rightarrow \{a\}$ and $\{a\} \Rightarrow \{b,d\}$. Is Confidence a symmetric measure?

Confidence - $\{b,d\} \Rightarrow \{a\}$
$$= \frac{\text{Sup}\{a, b, d\}}{\text{Sup} \{b,d\}} = \frac{0}{1} = \boxed{0} \quad \text{Ans}$$

Confidence $\{a\} \Rightarrow \{b,d\}$
$$= \frac{\text{Sup}\{a, b, d\}}{\{a\}} = \frac{0}{7} = \boxed{0} \quad \text{Ans}$$

Confidence is not symmetric measure.

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c) Build FP-tree for this transaction database for min _ sup = 3. Do not need to Build conditional FP-trees.

Sup $\{a\} = 7$
Sup $\{b\} = 4$
Sup $\{c\} = 7$ $\Rightarrow$ t-list $= e \rightarrow a \rightarrow c \rightarrow d \rightarrow b$
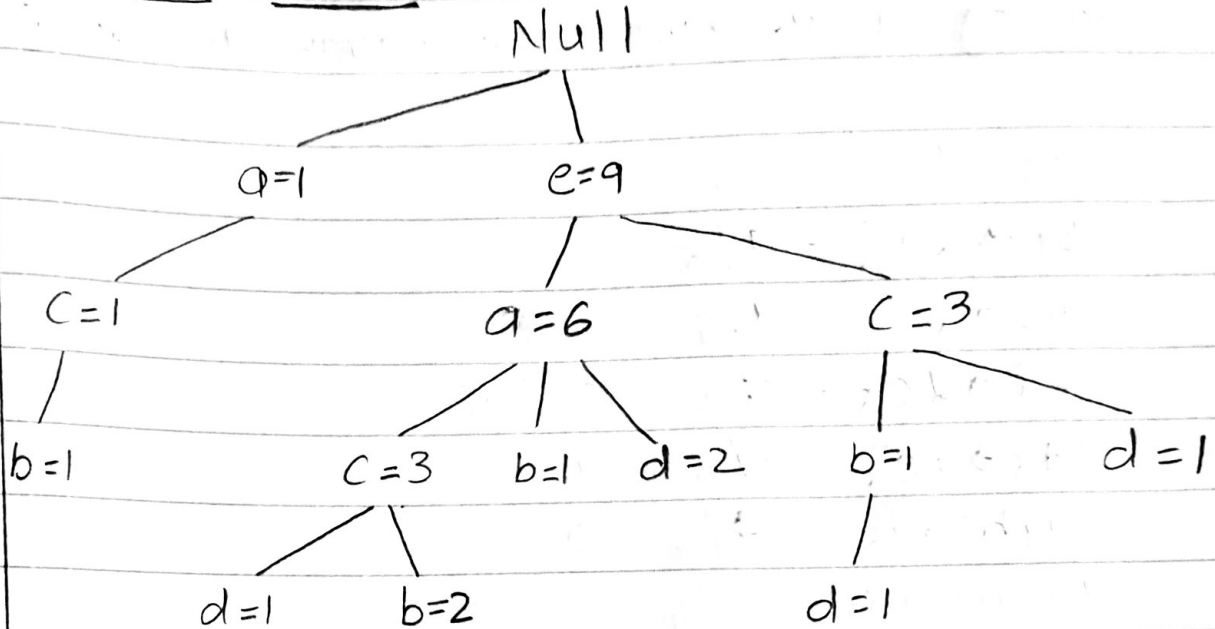Sup $\{d\} = 5$
Sup $\{e\} = 9$

Item-ID	Item bought
1	e, a, b
2	e, a, c, b
3	e, a, c, b
4	e, a, c, d
5	e, a, b, d
6	e, c, d
7	e, c,
8	e, a, d
9	e, a, d
10	a, c, b

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FP - Tree

```
                        Null
                    /          \
                  a=1          e=9
                 /          /    |    \
              C=1        a=6        C=3
             /         /   |   \      |    \
          b=1      C=3  b=1  d=2   b=1    d=1
                  /   \                |
               d=1    b=2             d=1
```

d) find all frequent itemsets using Apriori Algorithm for min_sup = 3.

a = 7
b = 4
c = 7
d = 5
e = 9

→

a,b = 4
a,c = 4
a,d = 3
a,e = 6
b,c = 4
~~b,d = 1~~
b,e = 4
c,d = 3
c,e = 6
d,e = 5

→

a,b,c = 3
~~a,b,d = 0~~
a,b,e = 3
~~a,c,d = 1~~
a,c,e = 3
a,d,e = 3
b,c,e = 3
~~b,c,d = 0~~
~~b,d,e = 1~~
c,d,e = 3

→

~~a,b,c,e = 2~~
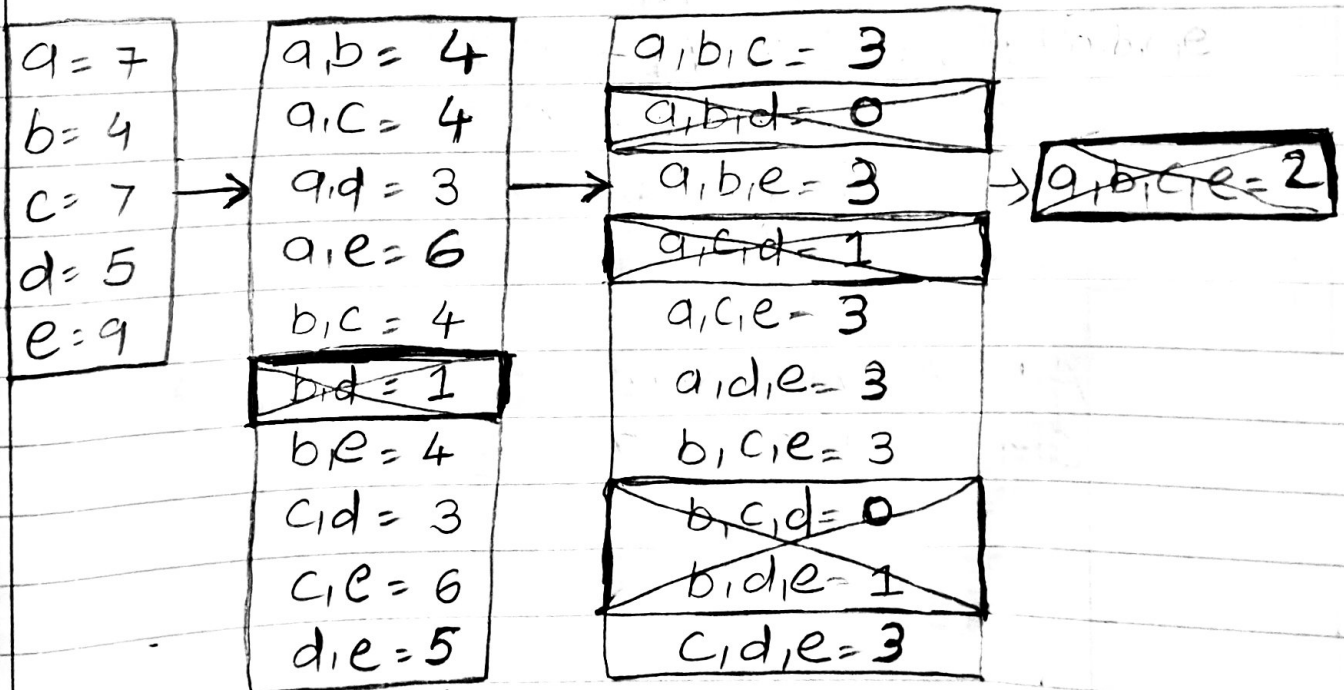
All frequent itemsets for min_sup = 3 are:-
a, b, c, d, (a,b), (a,c), (a,d), (a,e), (b,c), (b,e), (c,d), (c,e), (d,e), (a,b,c), (a,b,e), (a,c,e), (a,d,e) (b,c,e), (c,d,e)

e) using frequent itemsets in part(d), find all strong associations for confidence > 70%

$\{a\} \to \{e\} = 6/7 = 0.85$

$\{b\} \to \{a\} = 4/5 = 0.80$

$\{b\} \to \{c\} = 4/5 = 0.80$

$\{c\} \to \{e\} = 6/7 = 0.85$

$\{d\} \to \{e\} = 5/5 = 1$

$\{a,b\} \to \{e\} = 3/4 = 0.75$

$\{a,b\} \to \{c\} = 3/4 = 0.75$

$\{a,c\} \to \{b\} = 3/4 = 0.75$

$\{a,c\} \to \{e\} = 3/4 = 0.75$

$\{a,d\} \to \{e\} = 3/3 = 1$

$\{b,c\} \to \{a\} = 3/4 = 0.75$

$\{b,c\} \to \{e\} = 3/4 = 0.75$

$\{b,e\} \to \{a\} = 3/4 = 0.75$

$\{b,e\} \to \{c\} = 3/4 = 0.75$

$\{a,d\} \to \{e\} = 3/4 = 0.75$

All of the above associations have confidence > 70%