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 Reg. No: 12102801 Course Code: CAP-446
 Instructor: Dr. Geeta Sharma Assignment: 02

Q1. Prepare a FP growth tree for the following transactions. Given Minimum support = 2

Transaction ID	List of Items
T1	B, A, T
T2	A, C
T3	A, S
T4	B, A, C
T5	B, S
T6	A, S
T7	B, S
T8	B, A, S, T
T9	B, A, S

Sol: First we have to calculate the support of all the given items:-

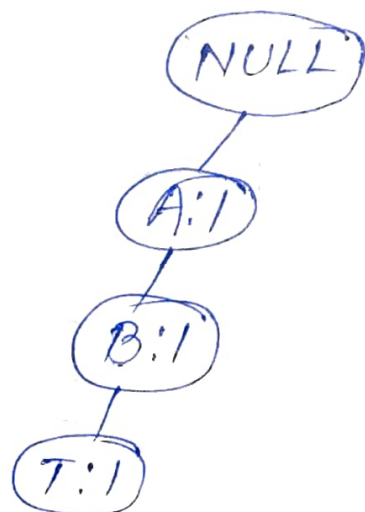
Item	Support
A	7
B	6
C	2
S	6
T	2

→ Now arrange the items in decreasing order means whose item have highest frequency comes first in the list of items.

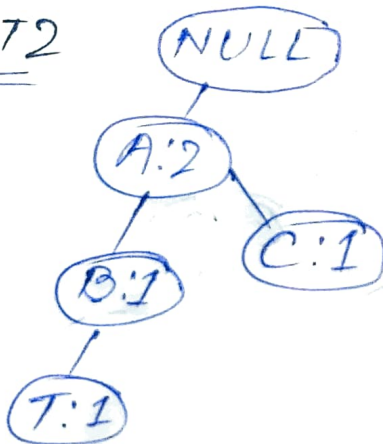
Transaction ID	List of Items
T1	A, B, T
T2	A, C
T3	A, S
T4	A, B, C
T5	B, S
T6	A, S
T7	B, S
T8	A, B, S, T
T9	A, B, S

→ Now construct the FP growth for all the TIDs. All the tree start with NULL.

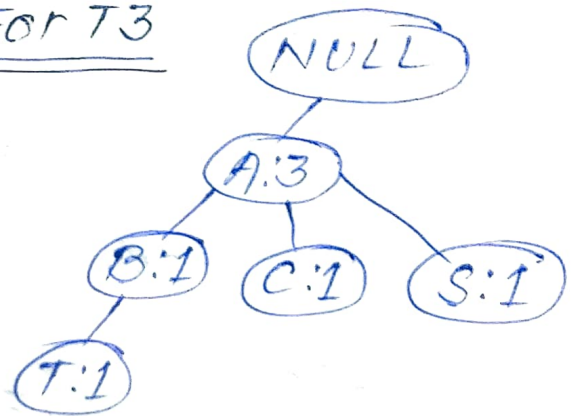
For T1



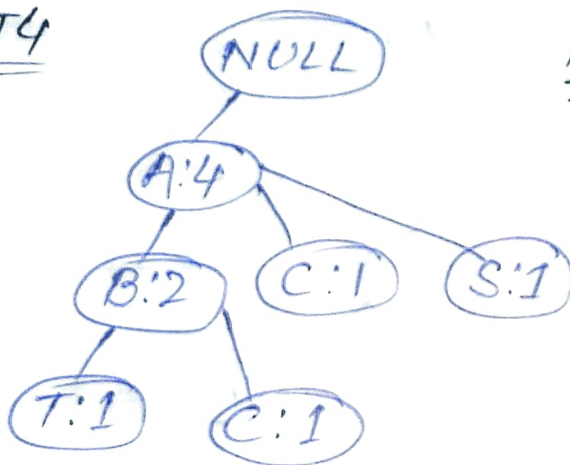
For T2



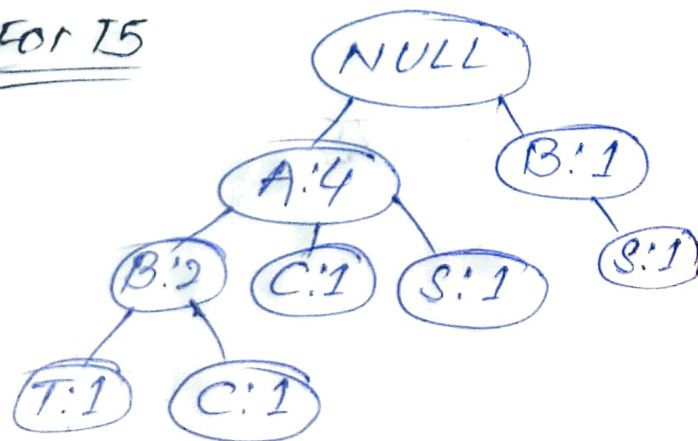
For T3



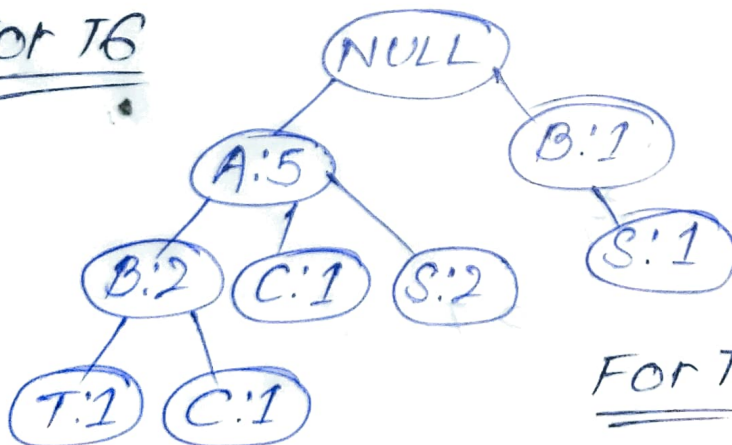
For T4



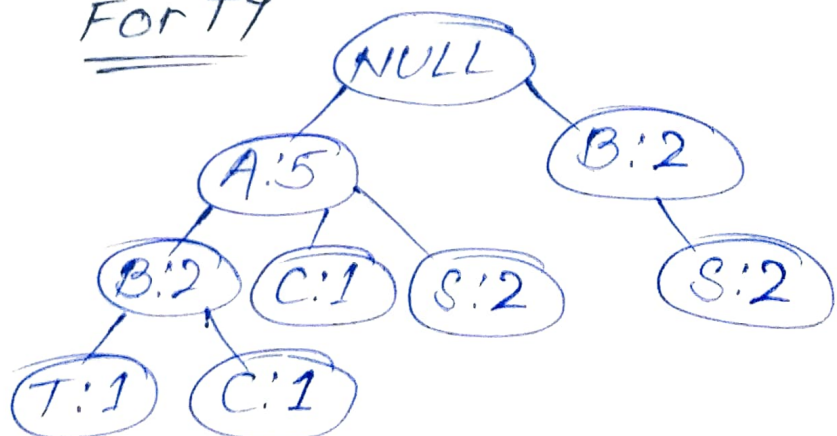
For T5



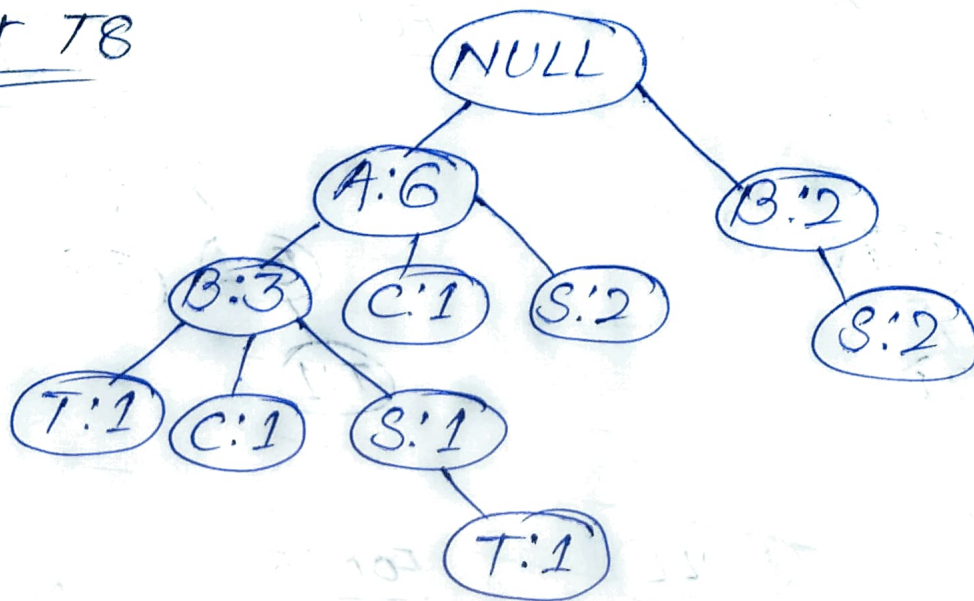
For T6



For T7



For T8



For T9

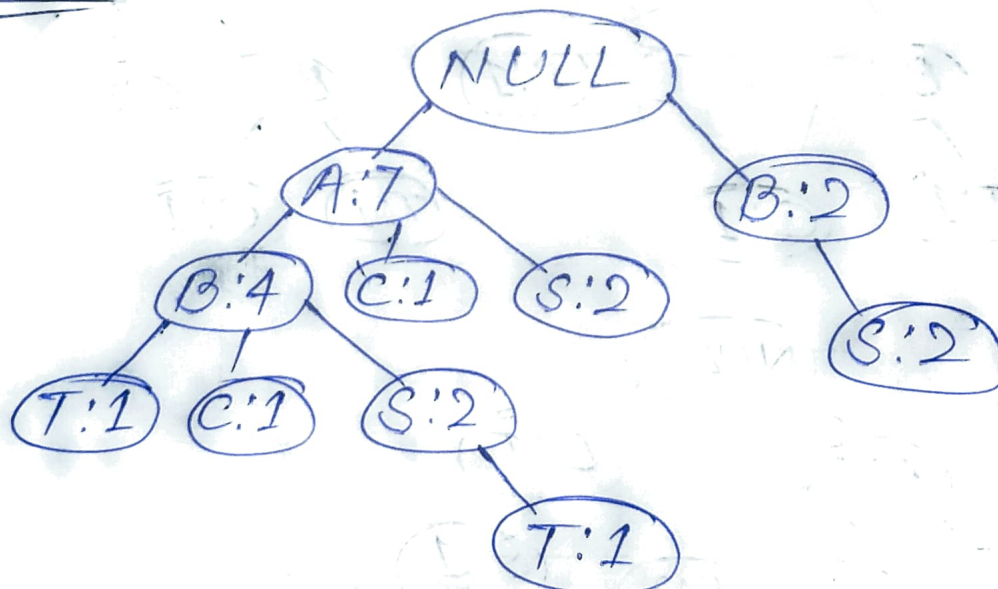


Fig: Final FP Tree

Q2: For the following given transaction dataset, generate rules using Apriori algorithm. Consider values as Support=30% and CONFIDENCE=60%.

TID	PRODUCTS			
1	Milk	Egg	Bread	Butter
2	Milk	Butter	Egg	Ketchup
3	Bread	Butter	Ketchup	
4	Milk	Bread	Butter	
5	Bread	Butter	Cookies	
6	Milk	Bread	Butter	Cookies
7	Milk	Cookies		
8	Milk	Bread	Butter	
9	Bread	Butter	Egg	Cookies
10	Milk	Butter	Bread	
11	Milk	Bread	Butter	
12	Milk	Bread	Cookies	Ketchup

Solⁿ: First we have to calculate the support of all the given products:-

$$\text{Support} = \frac{\text{No. of purchases item}}{n}$$

where n = total no. of transaction

① Milk - $\frac{9}{12} \times 100 = 75\%$

② Egg - $\frac{3}{12} \times 100 = 25\%$

$$\textcircled{3} \text{ Bread} - \frac{10}{12} \times 100 = 83.3\%$$

$$\textcircled{4} \text{ Butter} - \frac{10}{12} \times 100 = 83.3\%$$

$$\textcircled{5} \text{ Ketchup} - \frac{3}{12} \times 100 = 25\%$$

$$\textcircled{6} \text{ Cookies} - \frac{5}{12} \times 100 = 41.6\%$$

→ Delete those product whose support is less than 30%. Now we have:-

Products	Support
Milk	75%
Bread	83.3%
Butter	83.3%
Cookies	41.6%

→ Now make pair from the above given products and calculate its support.

$$\textcircled{1} \text{ Milk, Bread} - \frac{7}{12} \times 100 = 58\%$$

$$\textcircled{2} \text{ Milk, Butter} - \frac{7}{12} \times 100 = 58\%$$

$$\textcircled{3} \text{ Milk, Cookies} - \frac{3}{12} \times 100 = 25\%$$

$$\textcircled{4} \text{ Bread, Butter} - \frac{9}{12} \times 100 = 75\%$$

$$\textcircled{5} \text{ Bread, Cookies} - \frac{4}{12} \times 100 = 33.3\%$$

$$\textcircled{6} \text{ Butter, Cookies} - \frac{3}{12} \times 100 = 25\%$$

→ Again delete those pair of products whose support is less than 30%.
Now we have:-

Product	Support
Milk, Bread	58%
Milk, Butter	58%
Bread, Butter	75%
Bread, Cookies	33.3%

→ Now we have four product Milk, Bread, Butter, Cookies. Make group of three items from the given products and calculate its support.

① Milk, Bread, Butter - $\frac{6}{12} \times 100 = 50\%$.

② Milk, Bread, Cookies - $\frac{2}{12} \times 100 = 16.6\%$.

③ Milk, Butter, cookies - $\frac{1}{12} \times 100 = 8.3\%$.

④ Bread, Butter, Cookies - $\frac{3}{12} \times 100 = 25\%$.

→ Again delete those group of items whose support is less than 30%.
Now we have only left with one group.

Product	Support
Milk, Bread, Butter	50%

Frequent 3-item set: {Milk, Bread, Butter}

① Milk \rightarrow {Bread, Butter}

$$\text{Support} = \frac{6}{12}$$

$$\text{confidence} = \frac{\text{Support}(\text{Milk, Bread, Butter})}{\text{Support}(\text{Milk})}$$

$$= \frac{\frac{6}{12}}{\frac{9}{12}} = \frac{6}{12} \times \frac{12}{9} = \frac{6}{9} \times 100 = \boxed{66.6\%}$$

② Bread \rightarrow {Milk, Butter}

$$\text{Support} = \frac{6}{12}$$

$$\text{confidence} = \frac{\text{Support}(\text{Milk, Bread, Butter})}{\text{Support}(\text{Bread})}$$

$$= \frac{\frac{6}{12}}{\frac{10}{12}} = \frac{6}{12} \times \frac{12}{10} = \frac{6}{10} \times 100 = \boxed{60\%}$$

③ Butter \rightarrow {Milk, Bread}

$$\text{Support} = \frac{6}{12}$$

$$\text{confidence} = \frac{\text{Support}(\text{Milk, Bread, Butter})}{\text{Support}(\text{Butter})}$$

$$= \frac{\frac{6}{12}}{\frac{10}{12}} = \frac{6}{12} \times \frac{12}{10} = \frac{6}{10} \times 100 = \boxed{60\%}$$

④ {Milk, Bread} \rightarrow Butter

$$\text{support} = \frac{6}{12}$$

$$\text{confidence} = \frac{\text{support}(\text{Milk, Bread, Butter})}{\text{support}(\text{Milk, Bread})}$$

$$= \frac{\frac{6}{12}}{\frac{7}{12}} = \frac{6}{12} \times \frac{12}{7} = \frac{6}{7} \times 100 = \boxed{85.7\%}$$

⑤ {Milk, Butter} \rightarrow Bread

$$\text{support} = \frac{6}{12}$$

$$\text{confidence} = \frac{\text{support}(\text{Milk, Bread, Butter})}{\text{support}(\text{Milk, Butter})}$$

$$= \frac{\frac{6}{12}}{\frac{7}{12}} = \frac{6}{12} \times \frac{12}{7} = \frac{6}{7} \times 100 = \boxed{85.7\%}$$

⑥ {Bread, Butter} \rightarrow Milk

$$\text{support} = \frac{6}{12}$$

$$\text{confidence} = \frac{\text{support}(\text{Milk, Bread, Butter})}{\text{support}(\text{Bread, Butter})}$$

$$= \frac{\frac{6}{12}}{\frac{9}{12}} = \frac{6}{12} \times \frac{12}{9} = \frac{6}{9} \times 100 = \boxed{66.6\%}$$

\rightarrow Here all the six combinations satisfies the condition given in the question
confidence = 60%.