

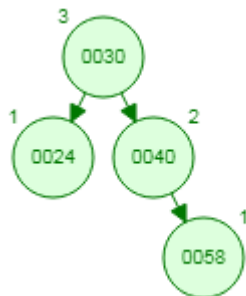
Universidade Federal da Fronteira Sul – UFFS  
Campus Chapecó  
Curso de Ciência da Computação  
Professor Jean Assmann Ferro  
Nome:Luandro

Estrutura de Dados II – 2018/2

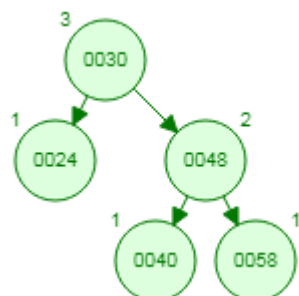
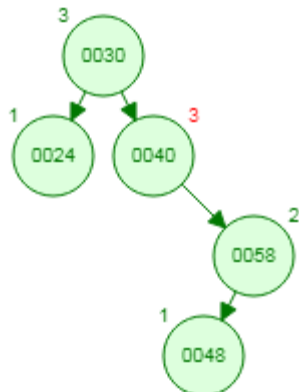
Exercícios 21/11/2018

1 - Insira em uma árvore AVL, itens com as chaves apresentadas nos itens a seguir (na ordem em que aparecem). Desenhe a árvore resultante da inserção, sendo que uma nova árvore deve ser desenhada quando houver uma rotação. Indique qual a rotação que foi executada.

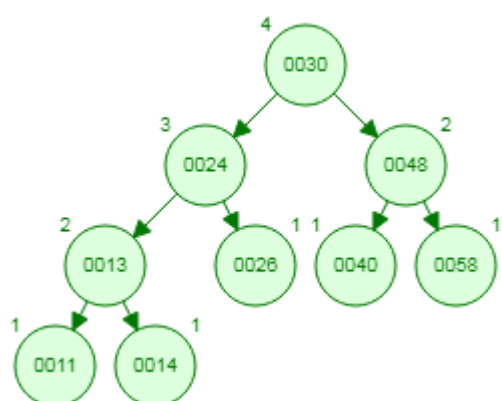
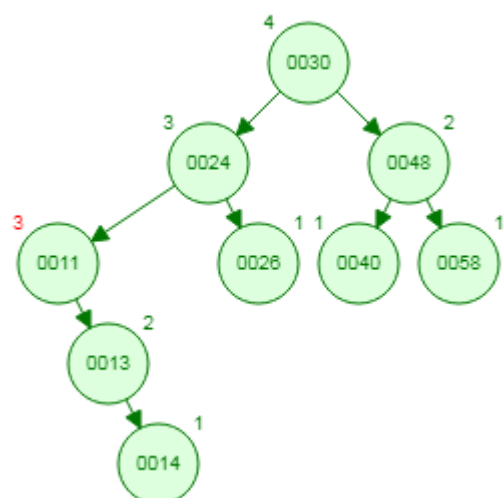
a) 30, 40, 24, 58, 48, 26, 11, 13, 14



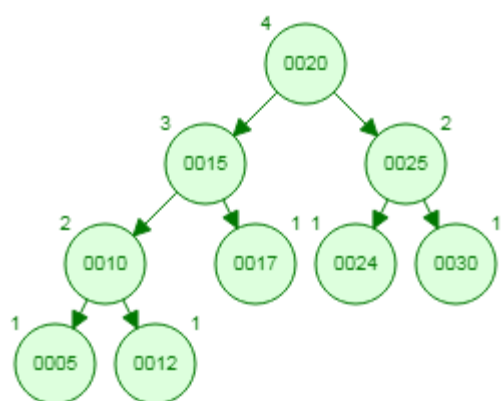
Dupla rotação a esquerda



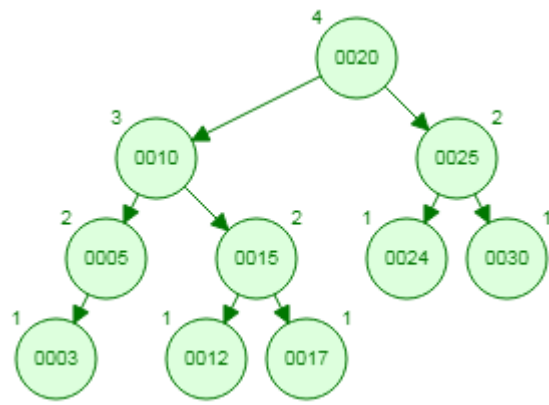
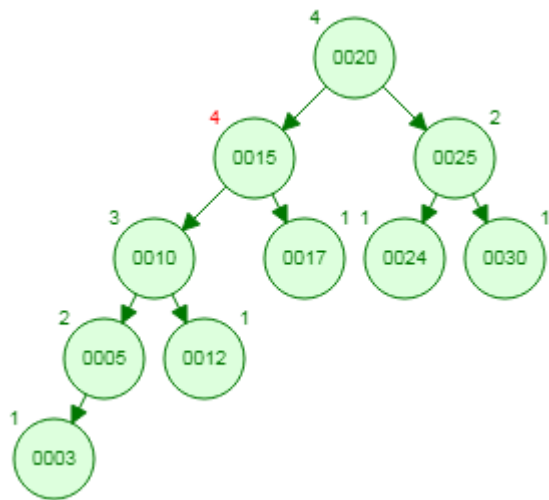
Rotação simples à esquerda



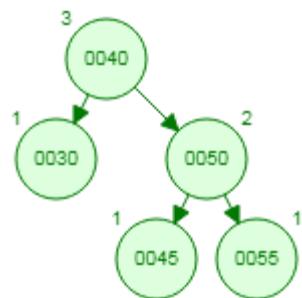
b) 20, 15, 25, 10, 30, 24, 17, 12, 5, 3



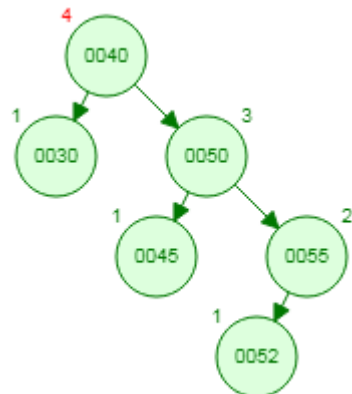
Rotação simples a direita

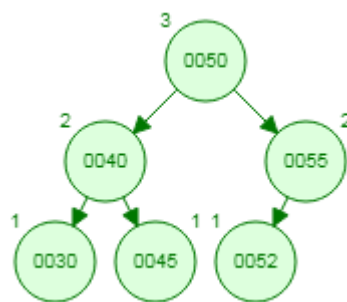


c) 40, 30, 50, 45, 55, 52

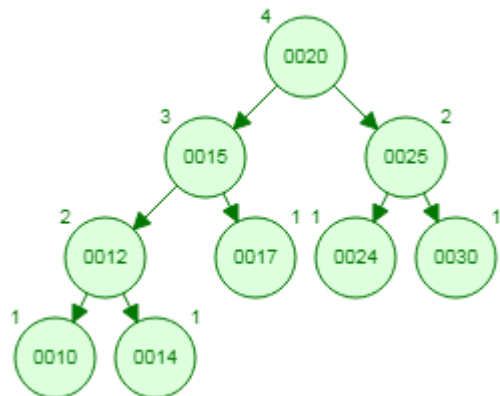


Rotação simples a esquerda

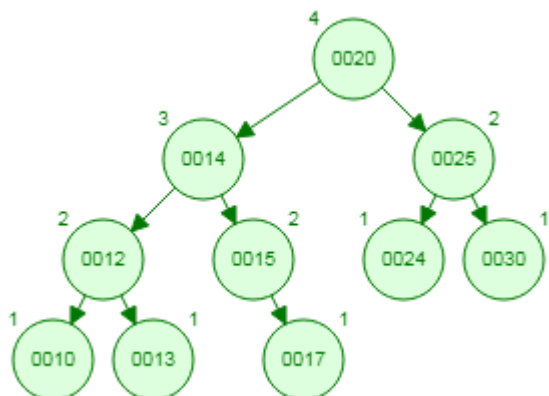
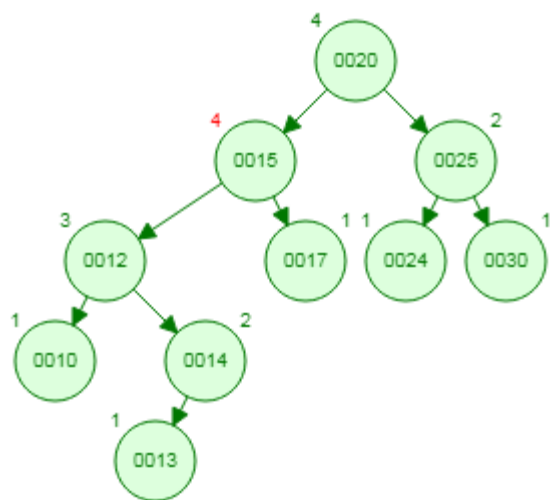




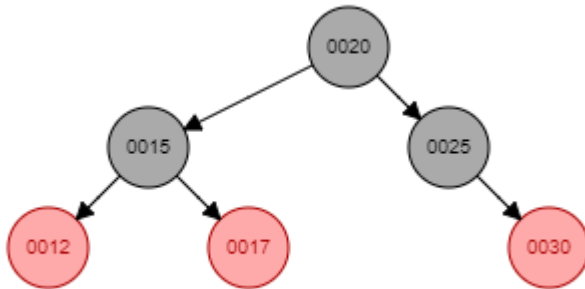
d) 20, 15, 25, 12, 17, 24, 30, 10, 14, 13



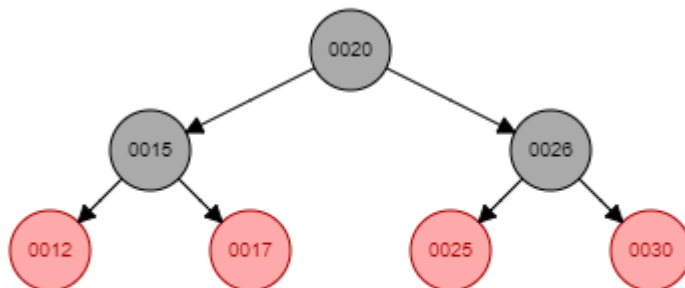
Dupla rotação a direita



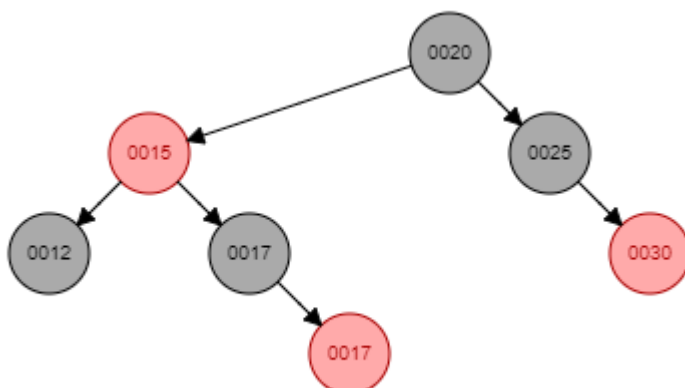
2 - Mostre as árvores Preto-Vermelhas que resultam após a inserção bem-sucedida das chaves 20, 15, 25, 12, 17, 30, 26 em uma árvore Preto-Vermelhas inicialmente vazia. Em seguida, mostre as árvores Preto-Vermelhas que resultam da eliminação sucessiva das chaves na seguinte ordem: 26, 17, 12, 25.



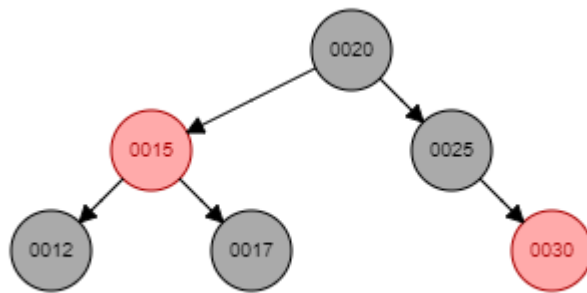
Nova rotação com a inserção do 26



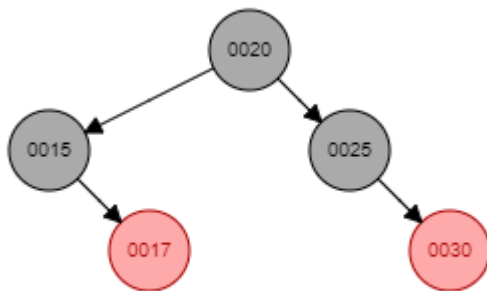
remoção sucessiva  
remoção do 26.



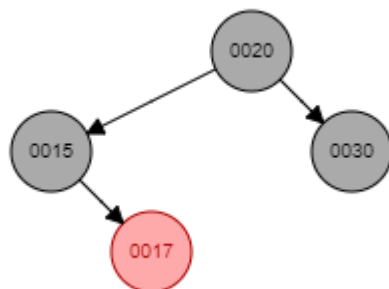
remoção 17.



remoção 12.

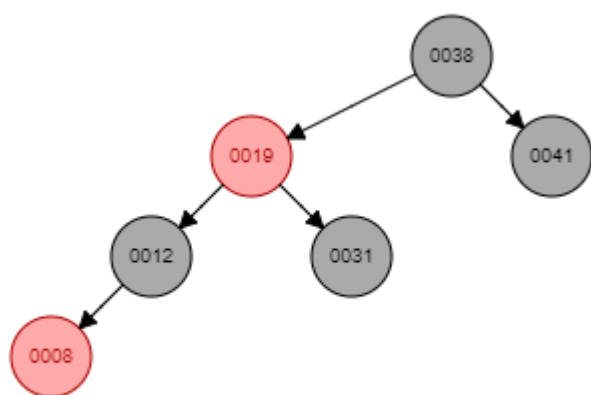


remoção 25.

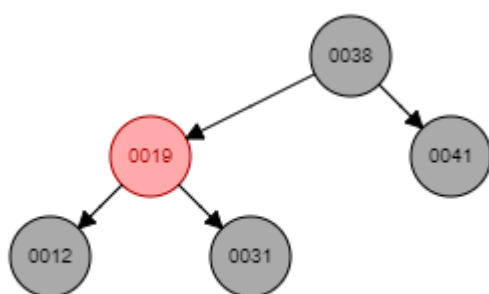


3 - Mostre as árvores Preto-Vermelhas que resultam após a inserção bem-sucedida das chaves 41, 38, 31, 12, 19, 8 em uma árvore Preto-Vermelhas inicialmente vazia. Em seguida, mostre as árvores Preto-Vermelhas que resultam da eliminação sucessiva das chaves na seguinte ordem: 8, 12, 19, 31, 38, 41.

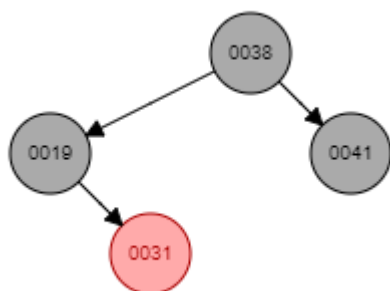
Inserção



remoção  
remoção 8.



remoção 12.



remoção 19.



remoção 31.



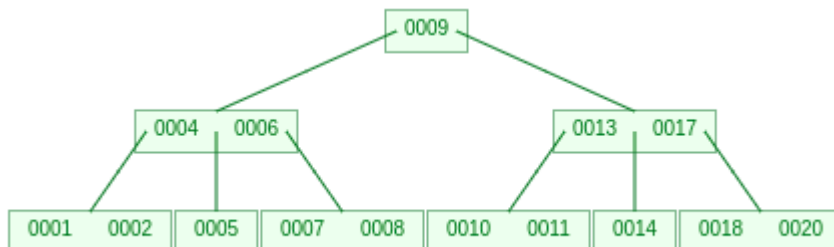
remoção 38.



remoção 41.

Após o último elemento ser deletado a árvore red/black ficará vazia .

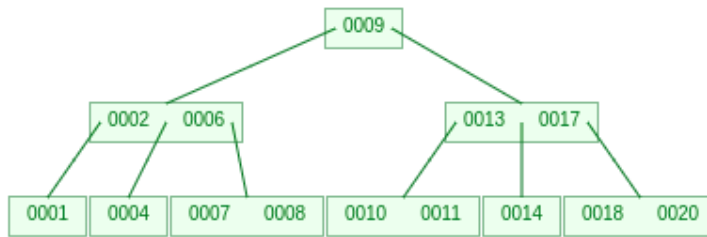
4 - Inserir numa árvore B a sequência de números: 18, 13, 17, 8, 9, 11, 6, 4, 1, 20, 5, 14, 7, 2, 10, considerando  $t=3$ .



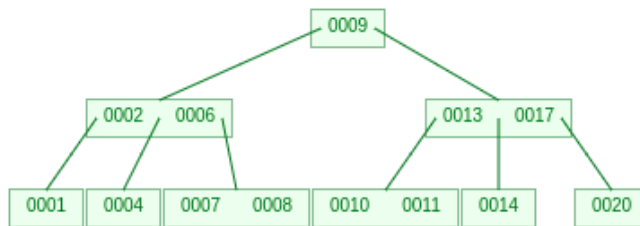
5 - Tendo como base a árvore final do exercício anterior, remova a sequência de números: 5, 18, 10, 13, 7, 20.

Removendo o n. 5

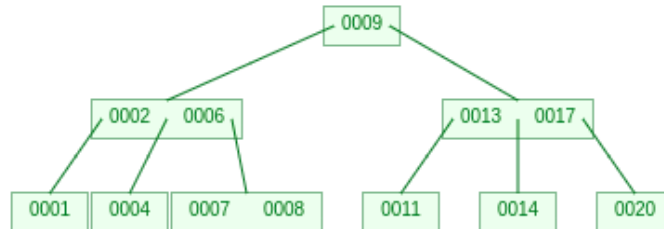




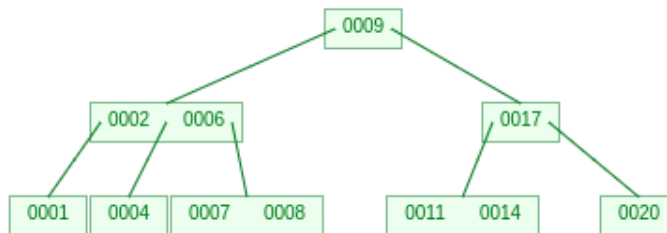
Removendo o n. 18



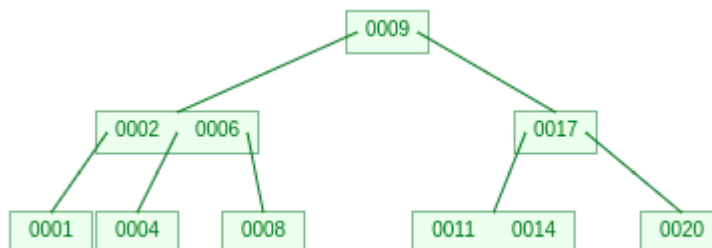
Removendo o n. 10



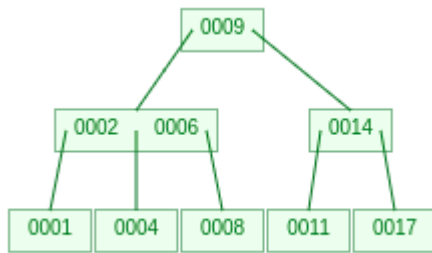
Removendo o n. 13



Removendo o n. 7



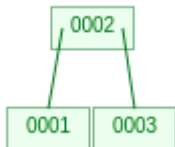
Removendo o n. 20

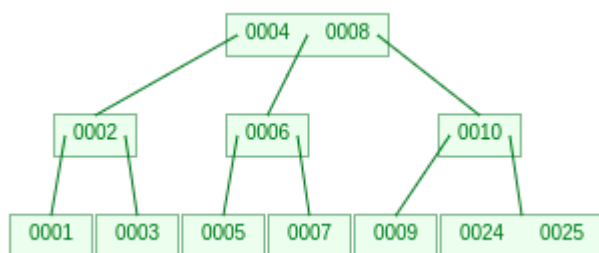
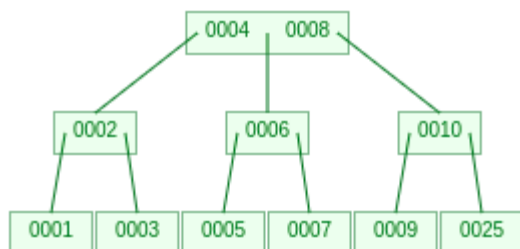
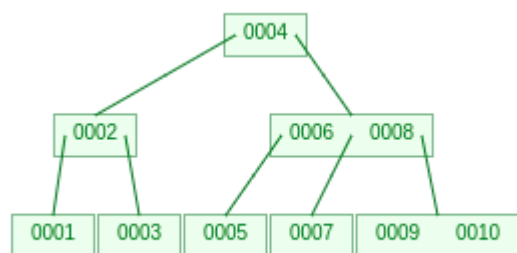
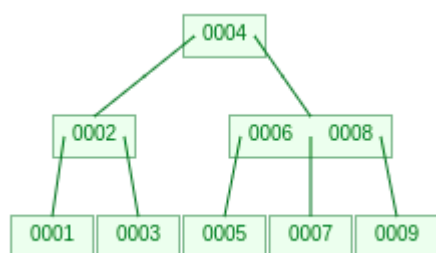
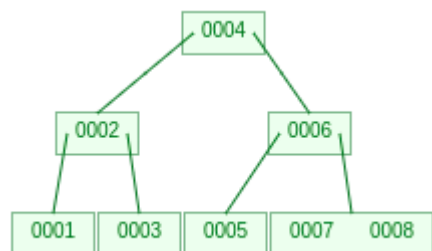
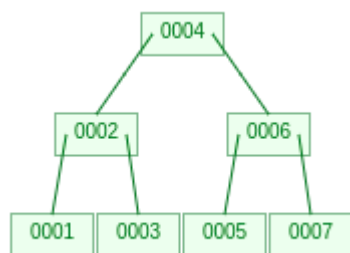


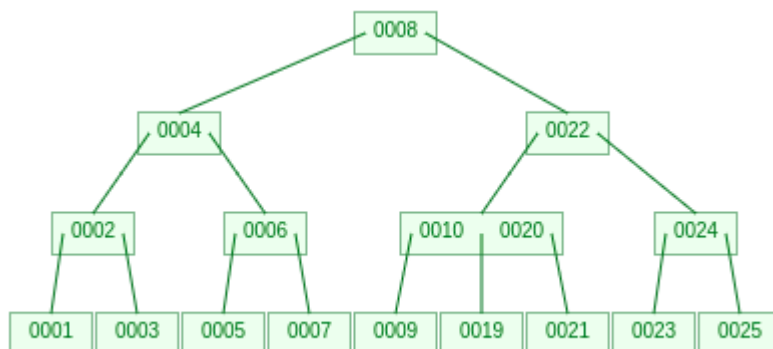
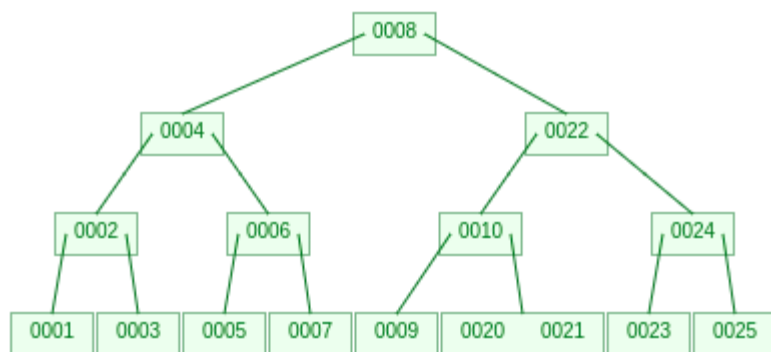
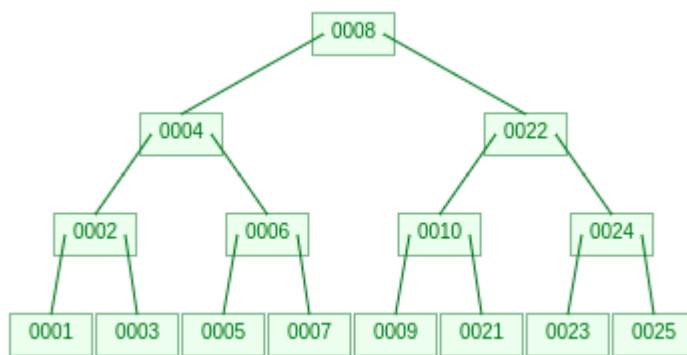
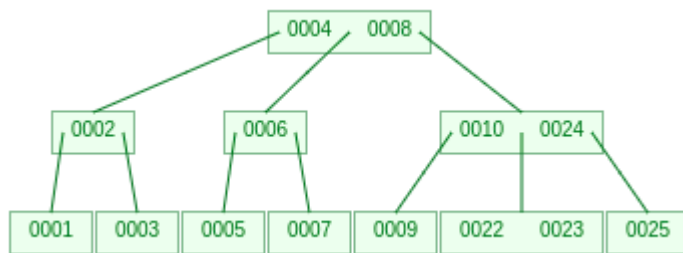
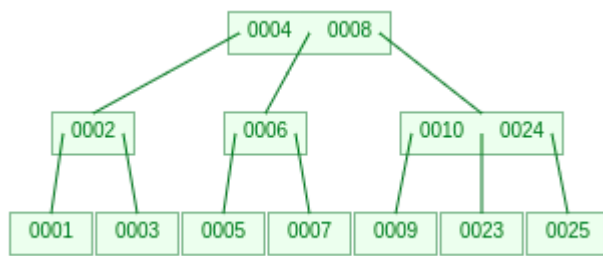
6 - Mostre o passo a passo da inserção dos valores 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 25, 24, 23, 22, 21, 20, 19, 18, 17, 16, 15, 14, 11, 12, e 13 e depois a remoção dos valores 17, 14, 12, 10, 21, 18, 2, 8, 25 e 19 em:

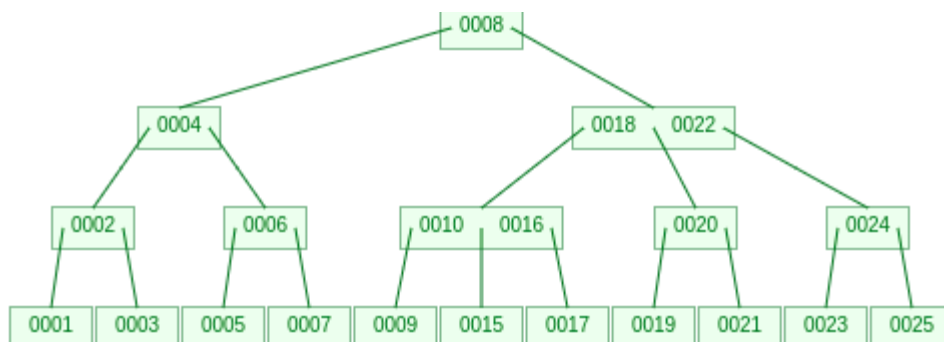
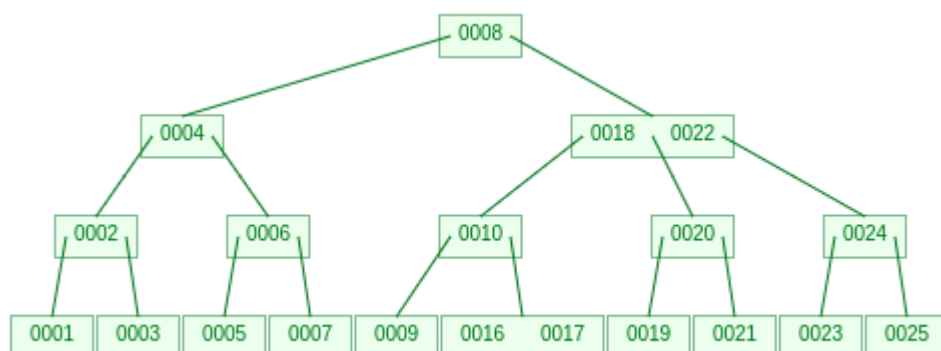
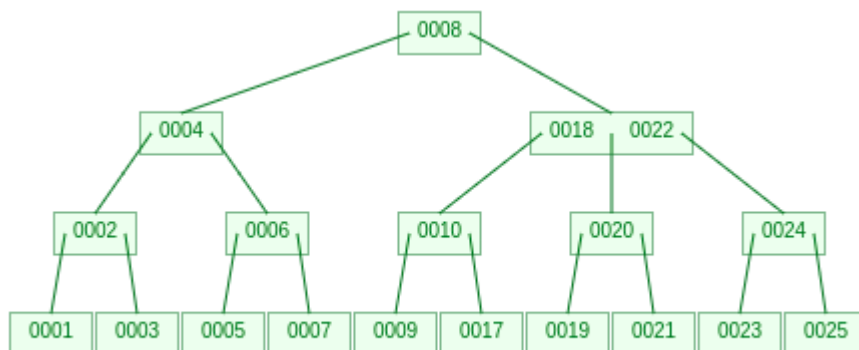
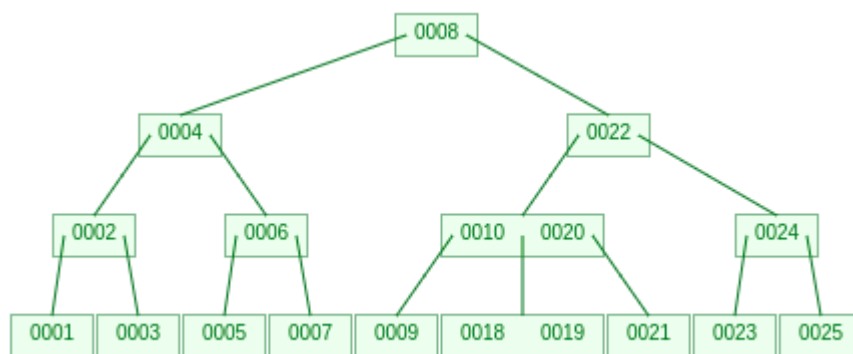
- Uma árvore B com  $M=3$
- Uma árvore B com  $M=5$
- Uma árvore B+ com  $M=3$
- Uma árvore B+ com  $M=5$

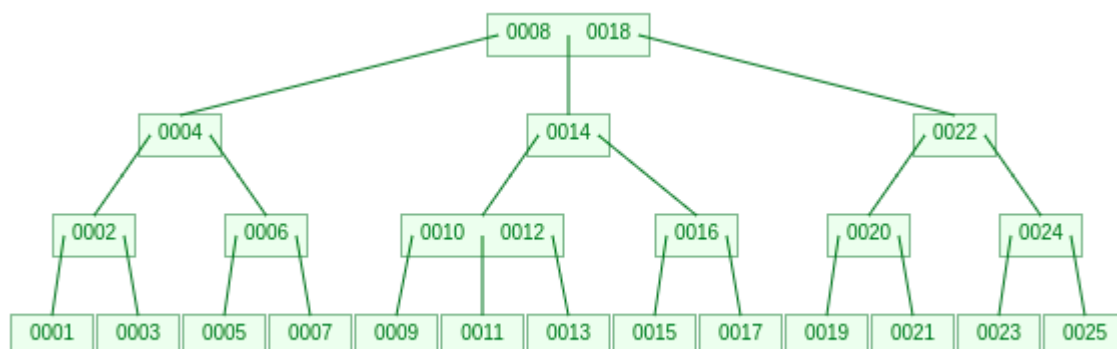
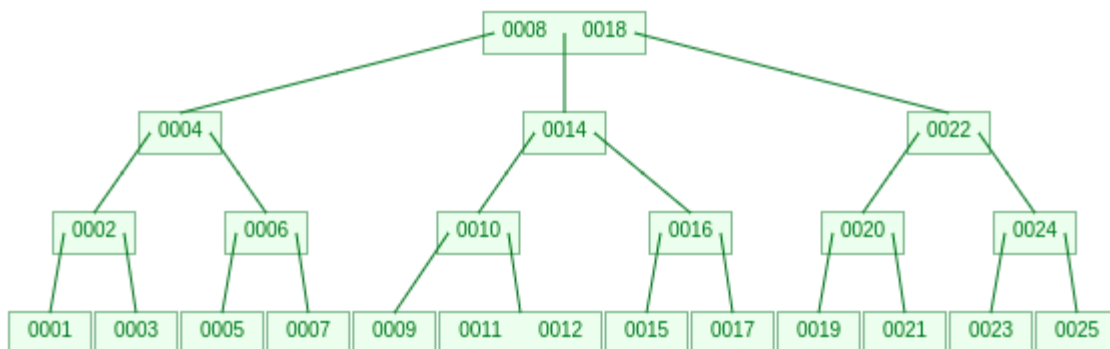
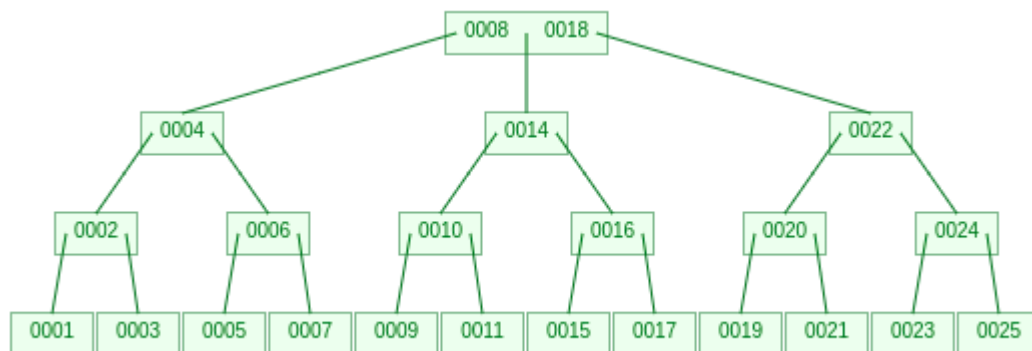
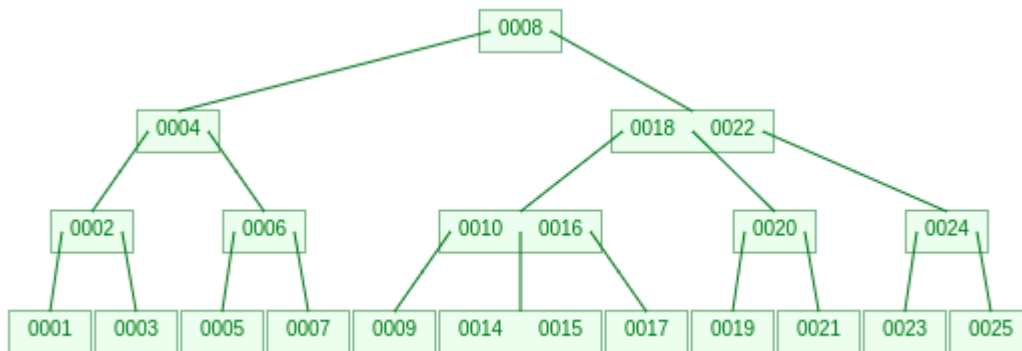
A)



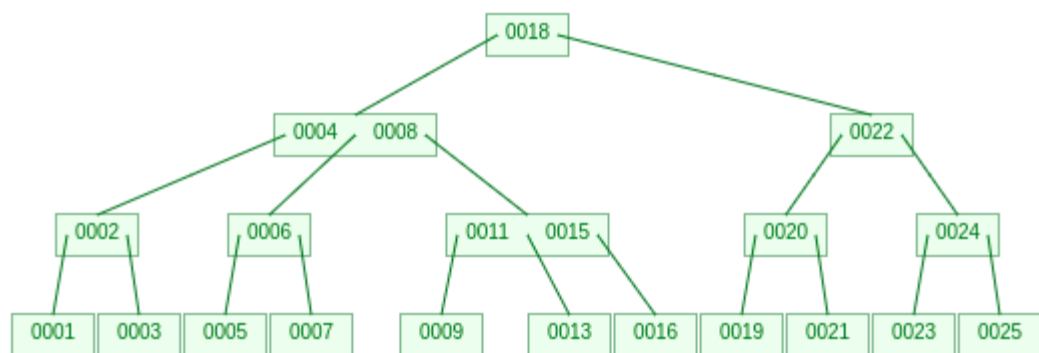
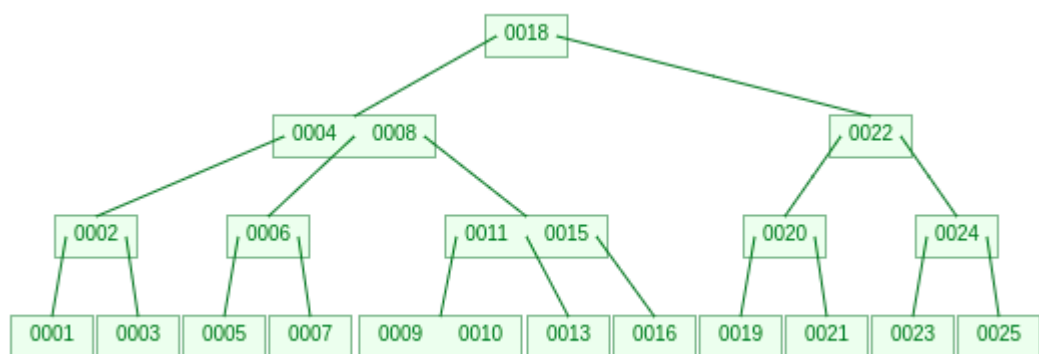
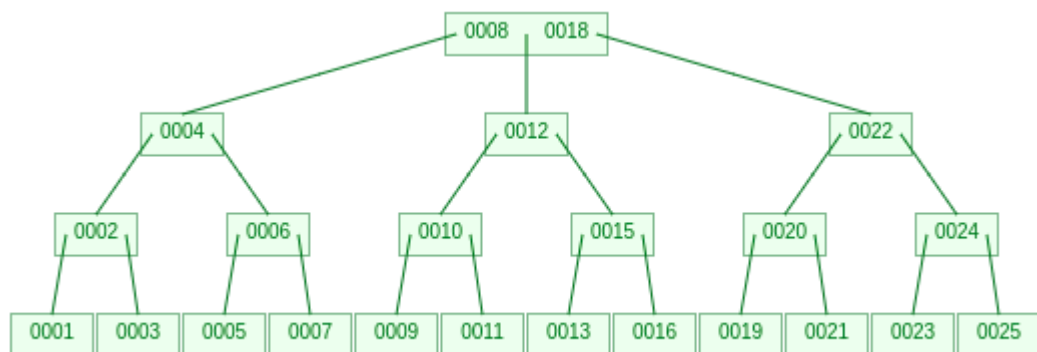
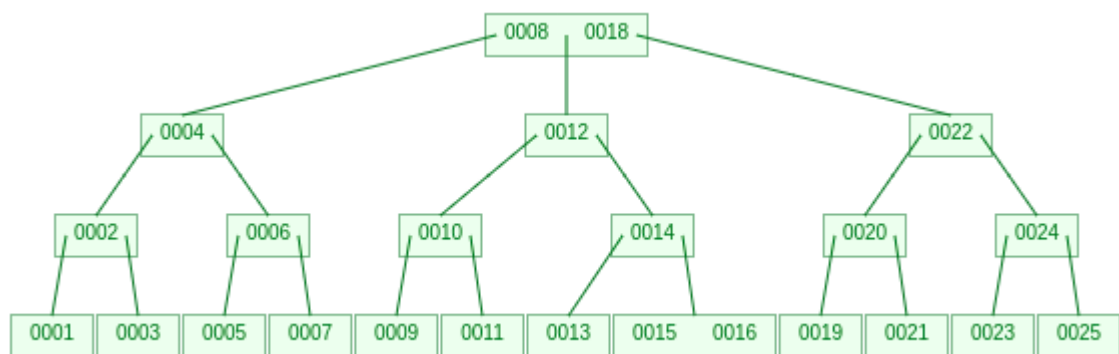


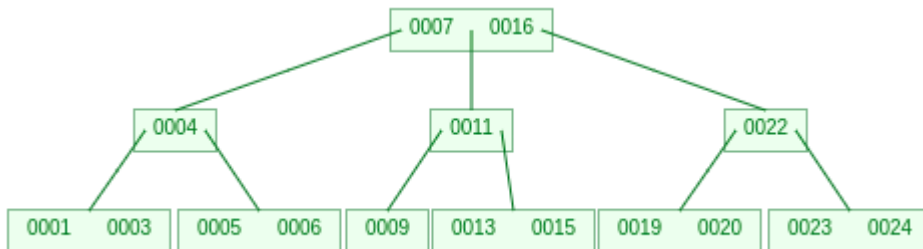
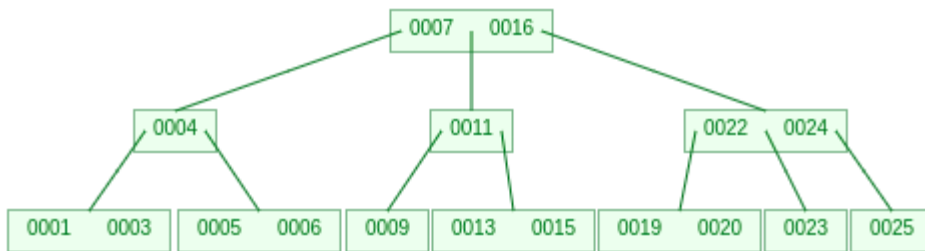
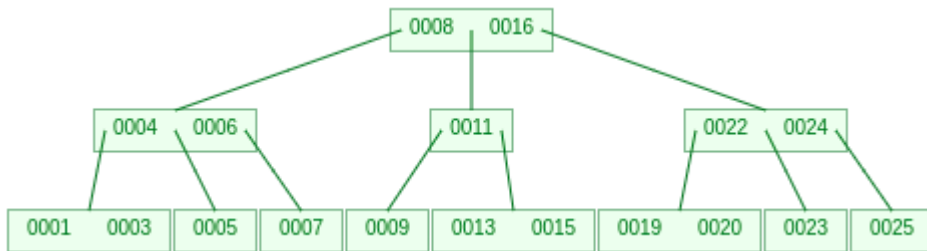
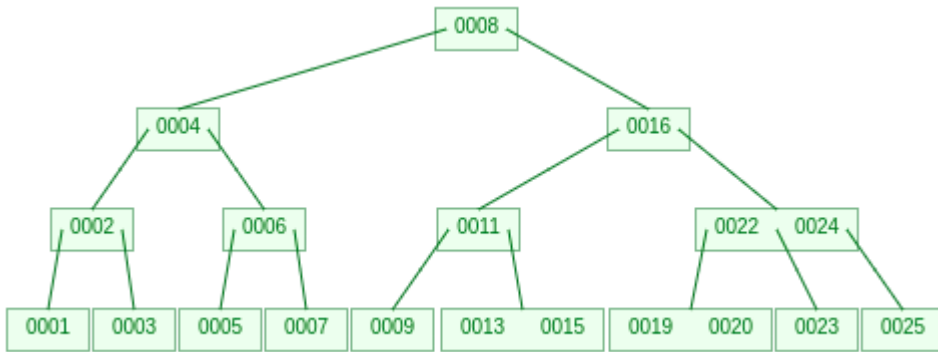
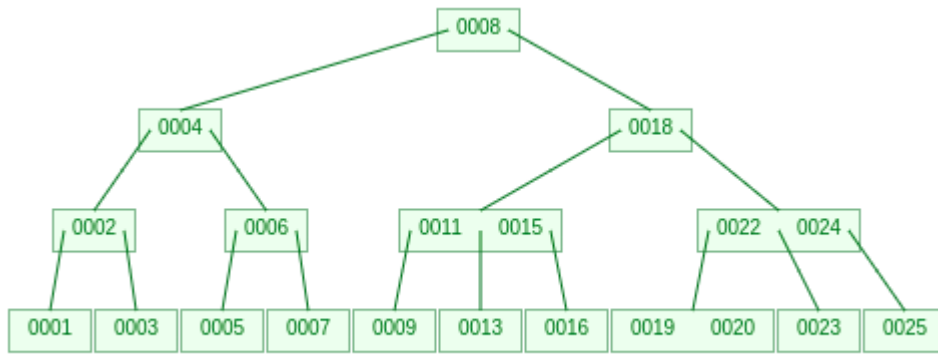




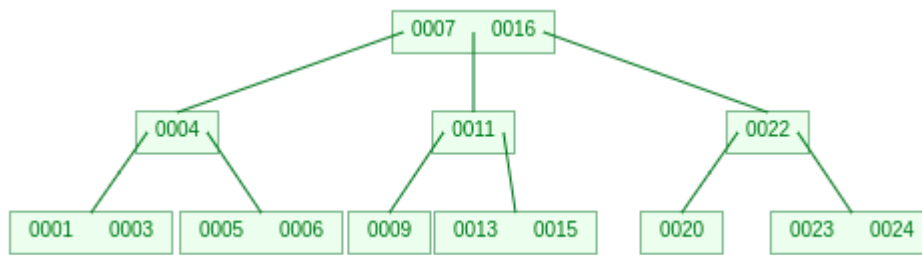


Removendo

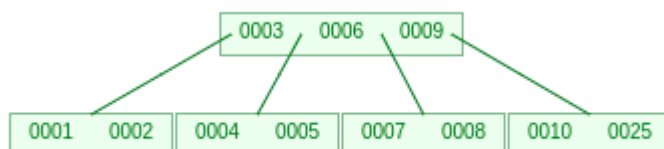
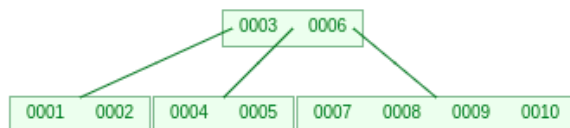
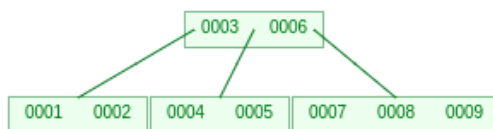
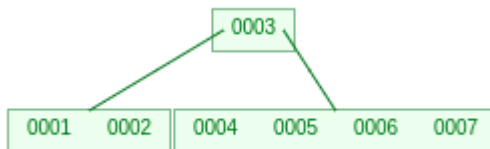
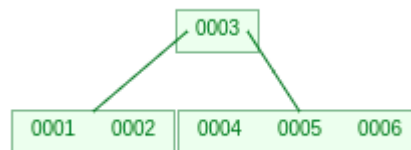


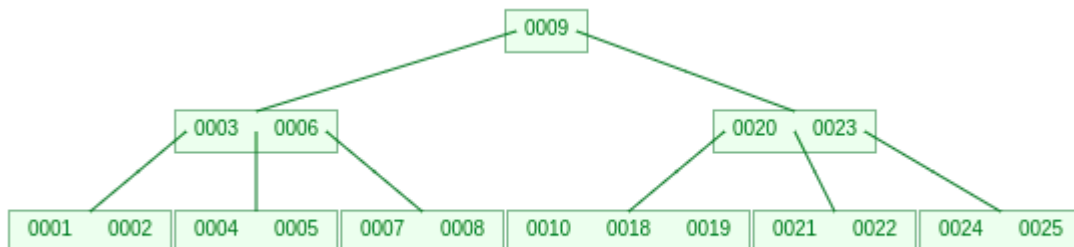
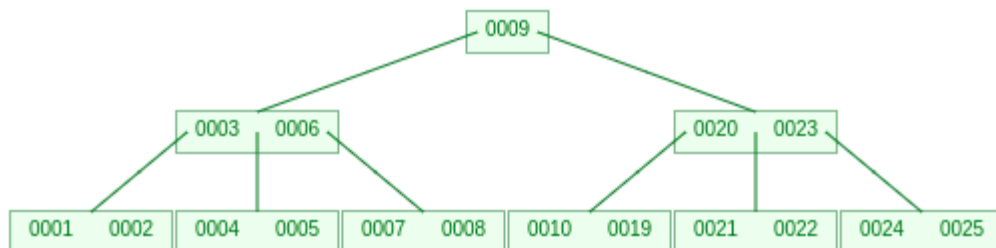
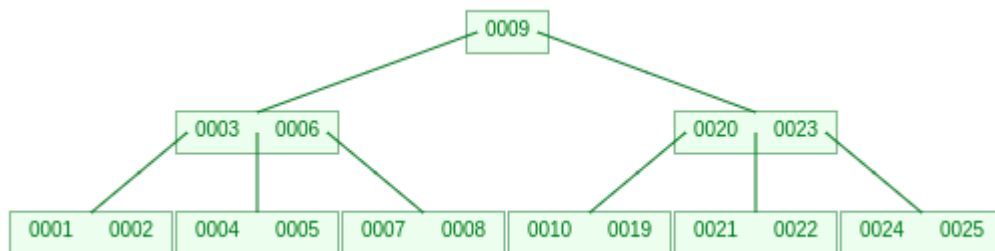
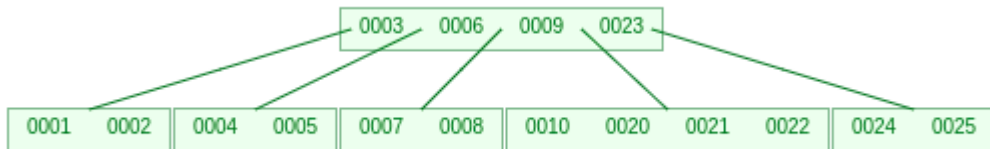
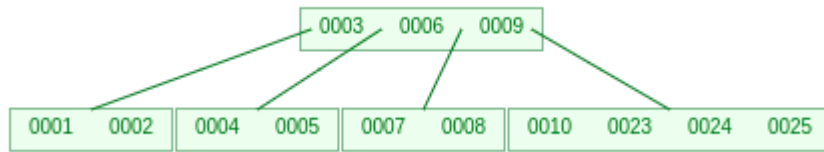


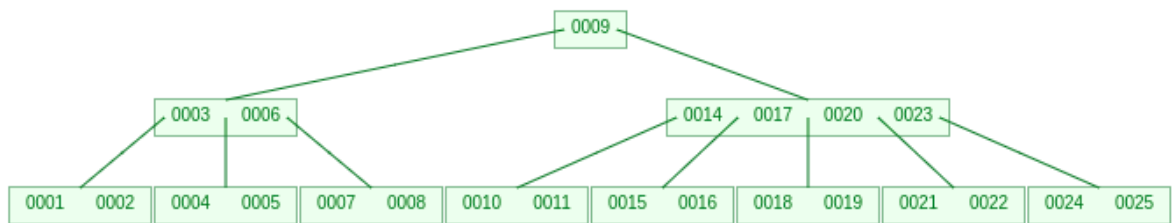
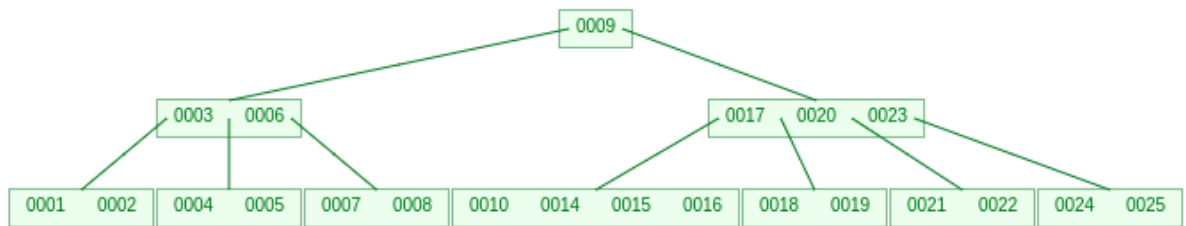
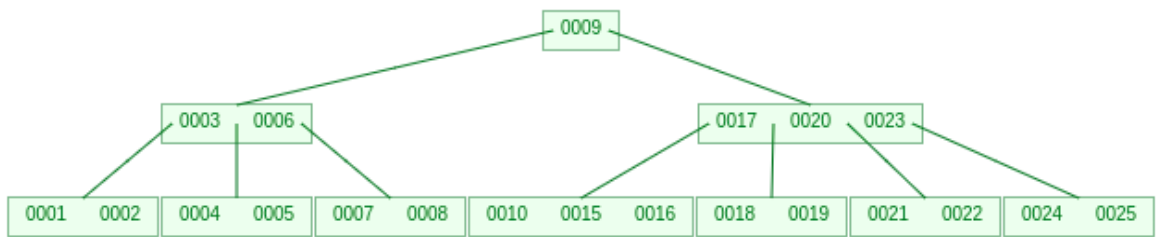
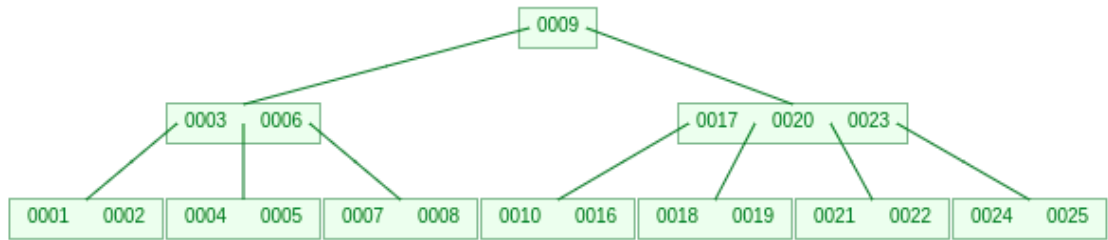
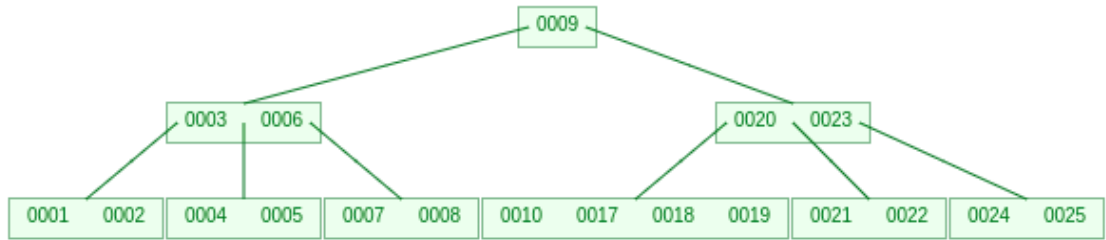


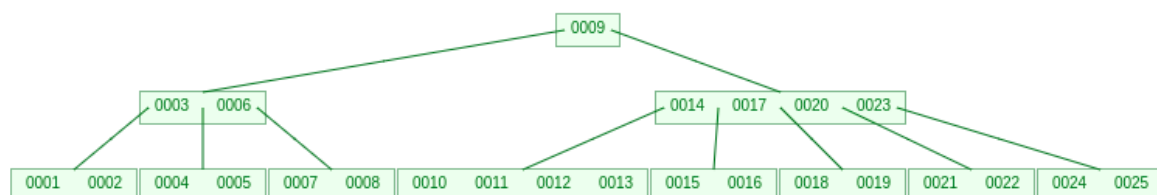
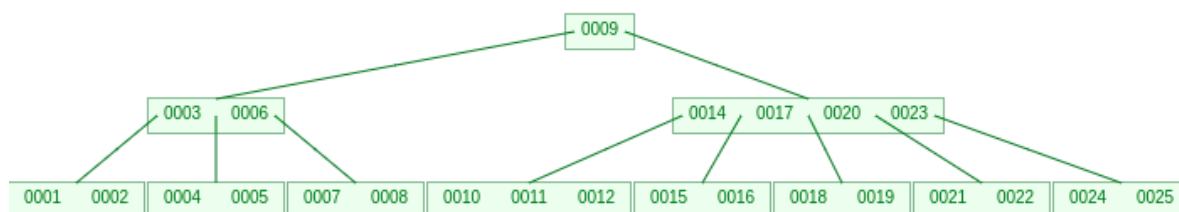


B)

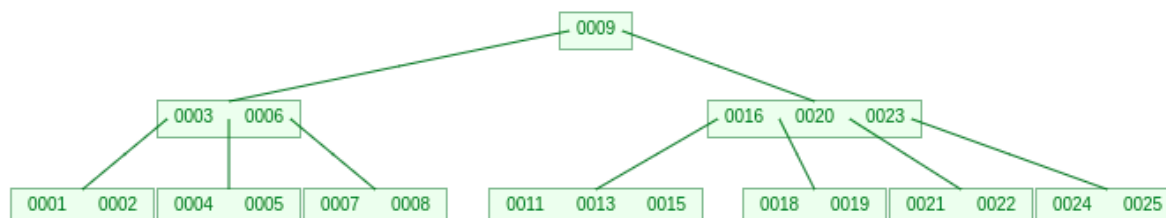
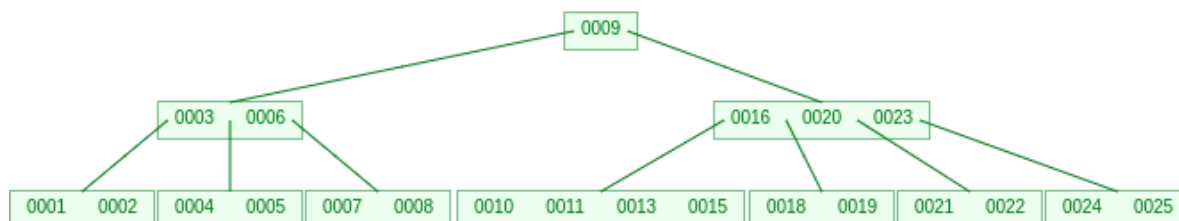
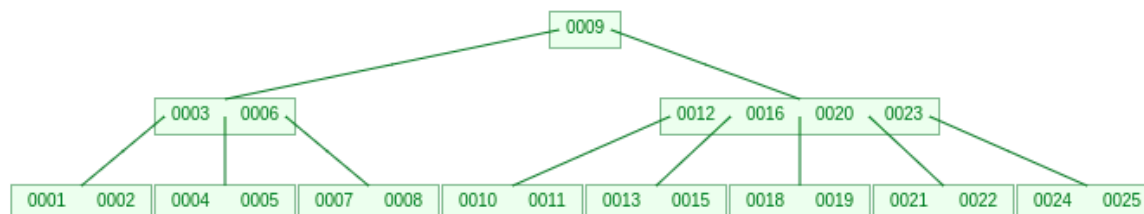
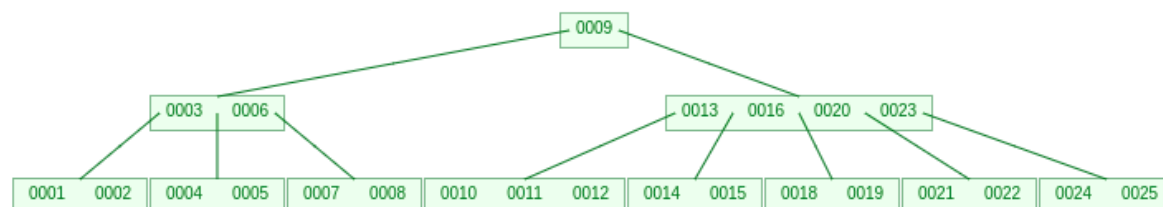


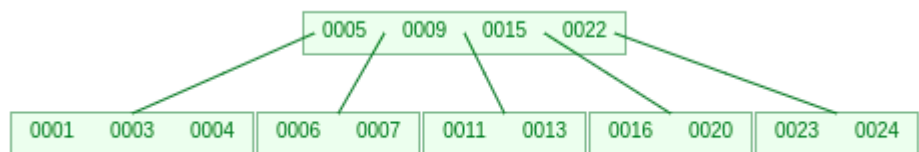
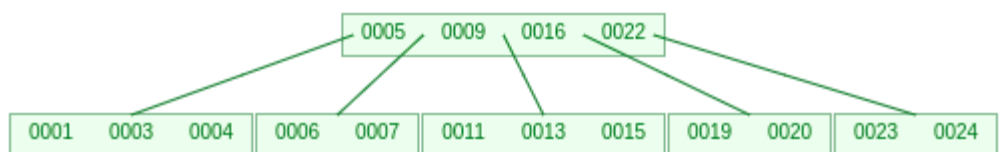
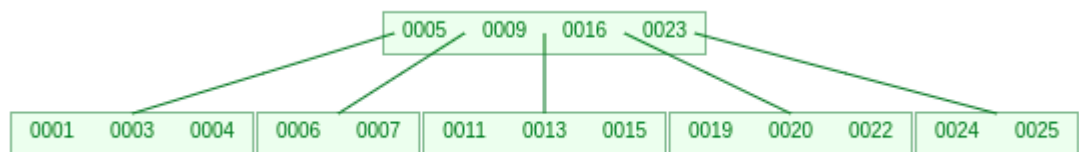
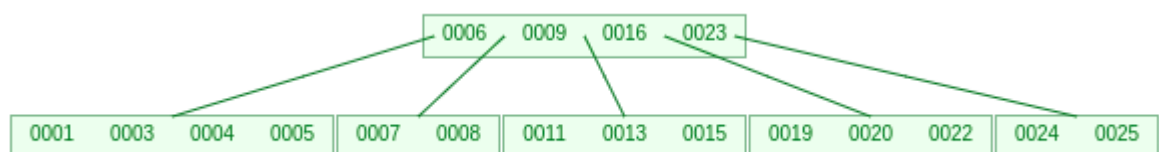
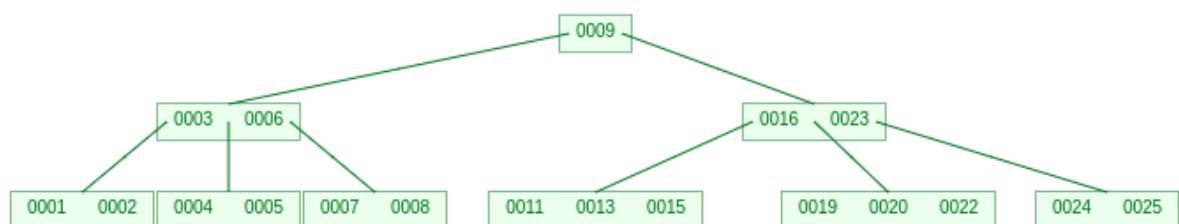
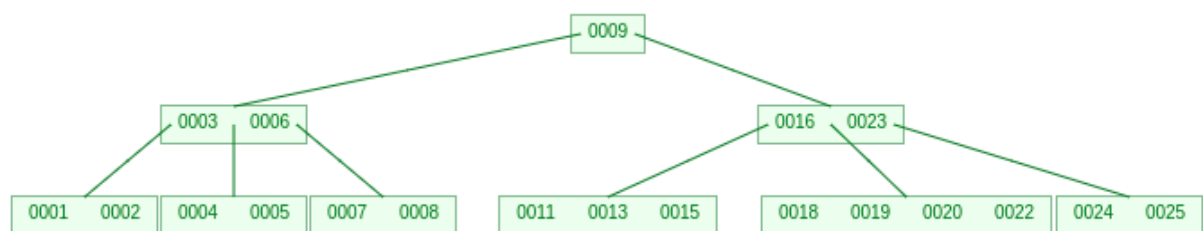






removendo

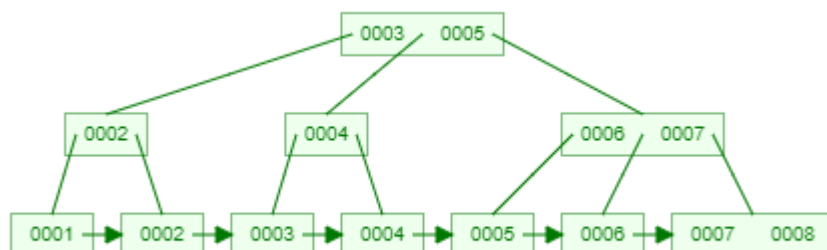
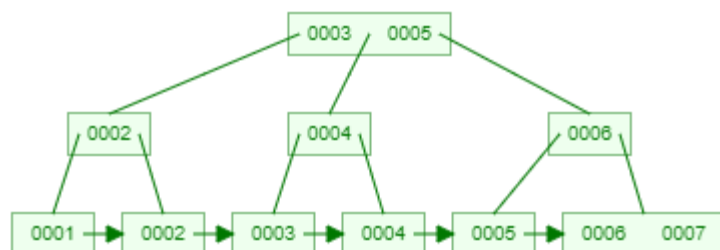
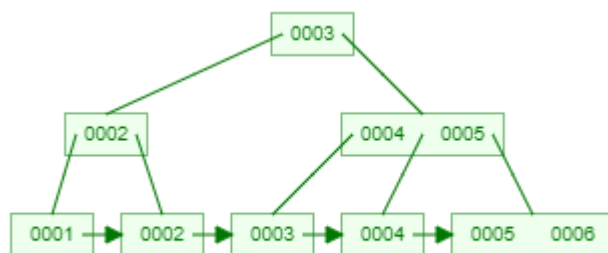
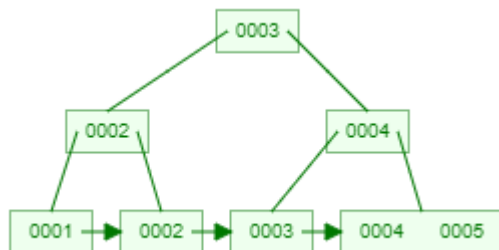
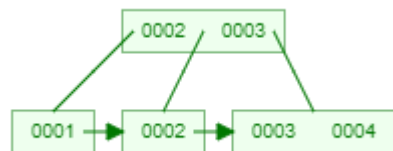
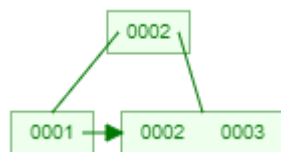


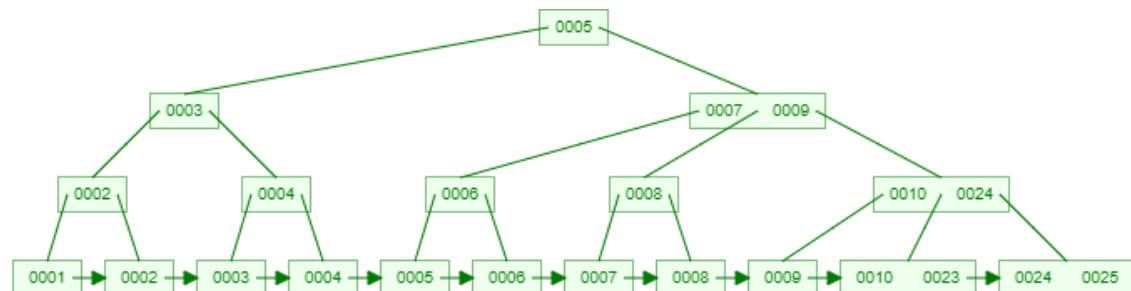


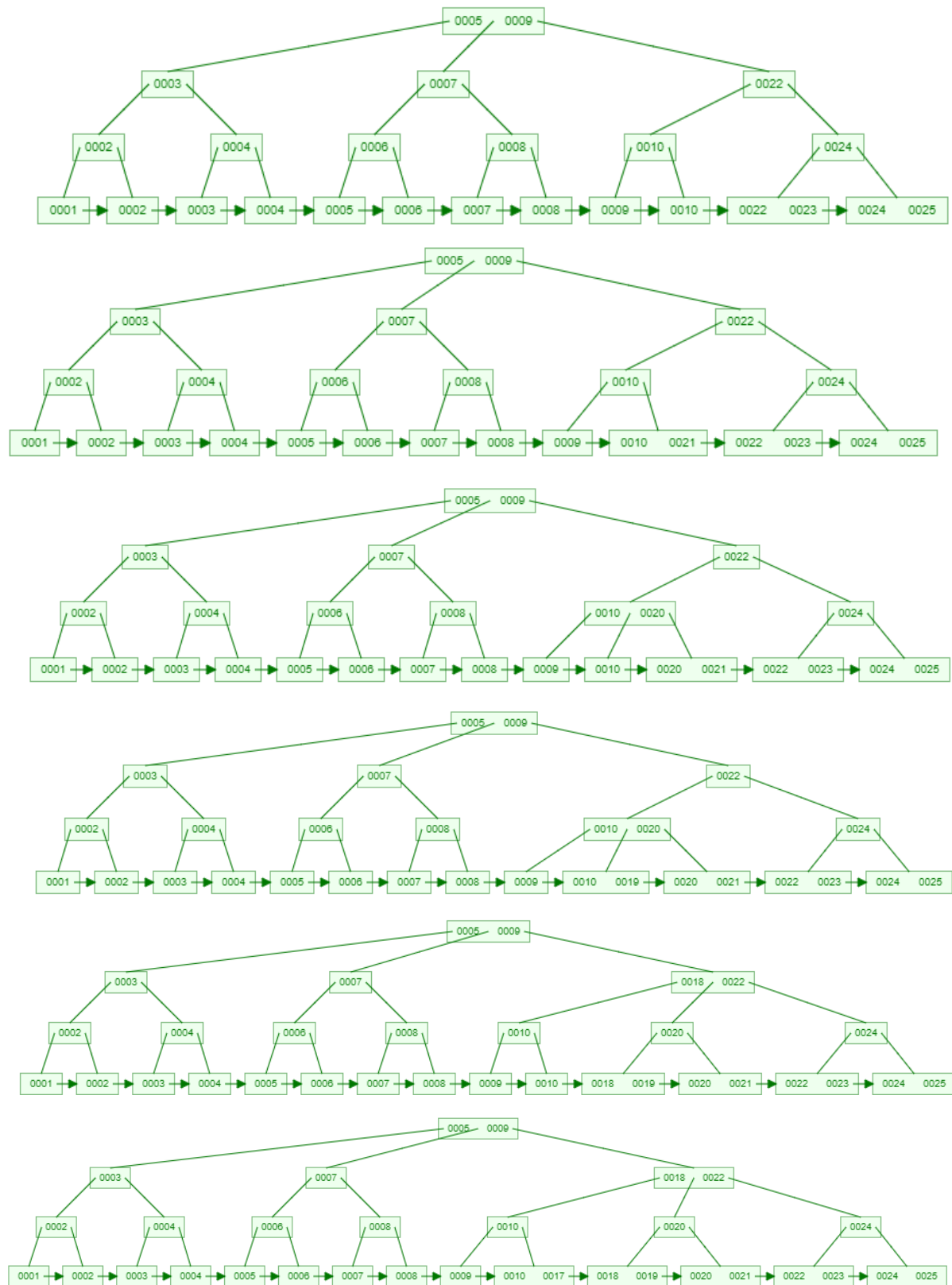
C)  
inserção.

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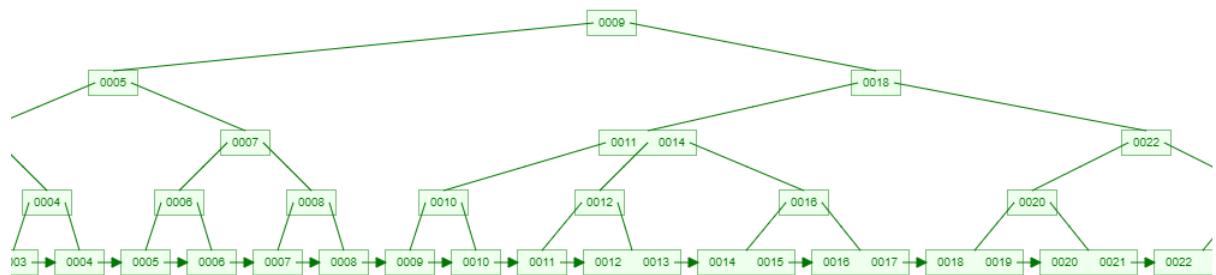
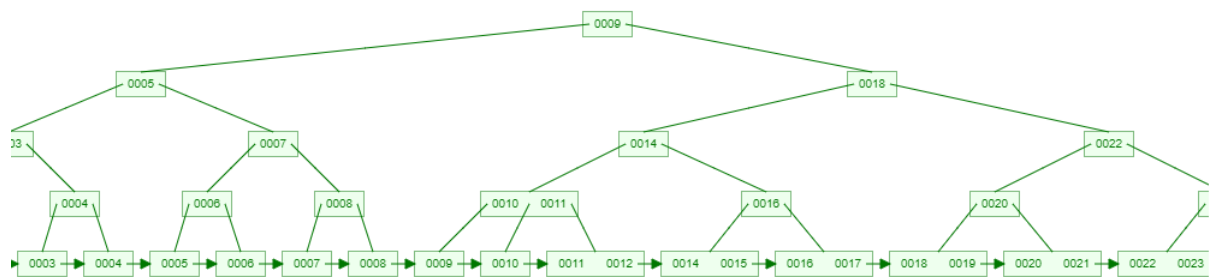
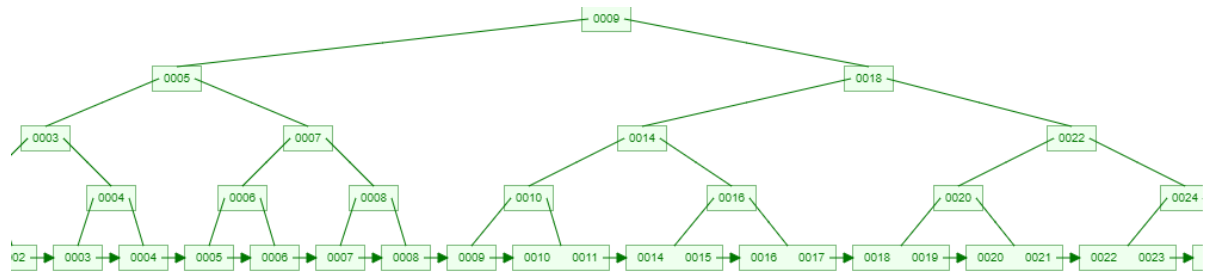
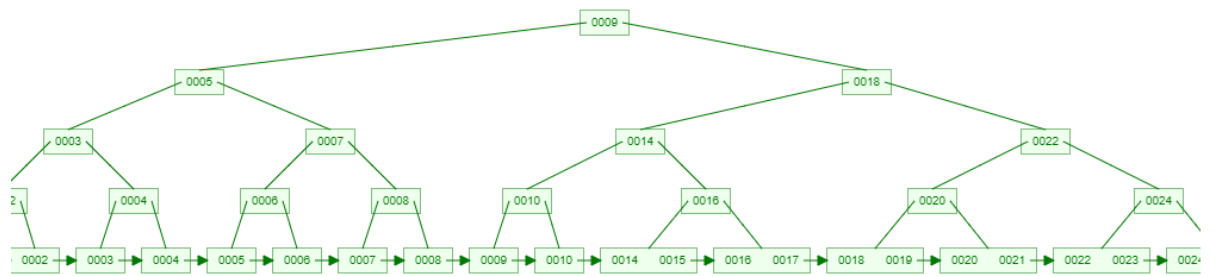
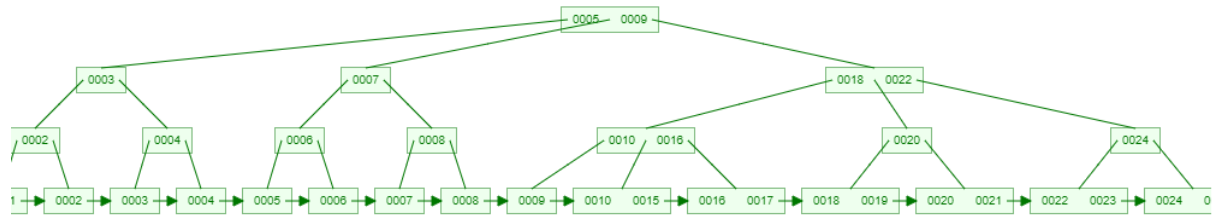
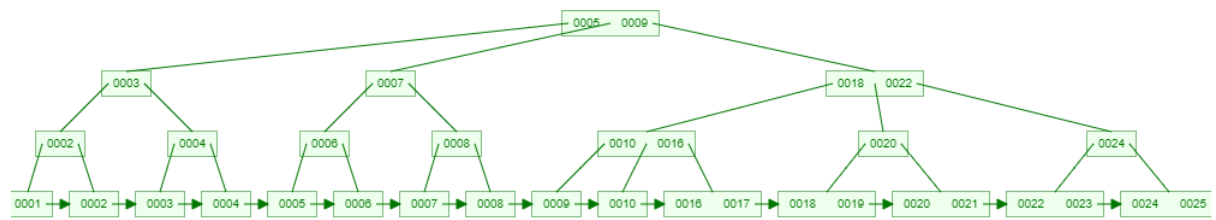
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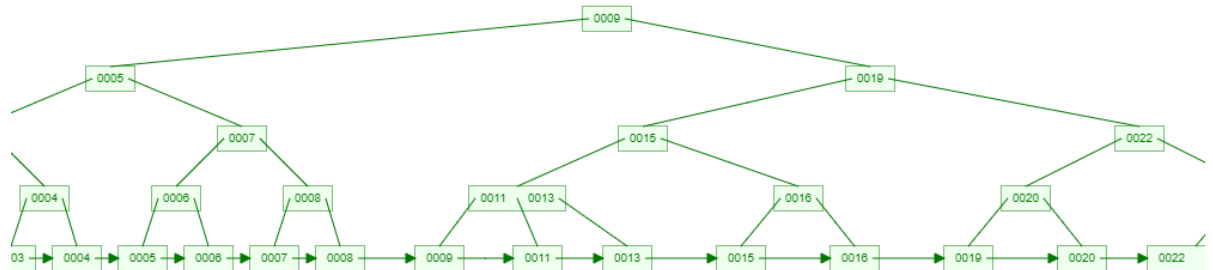
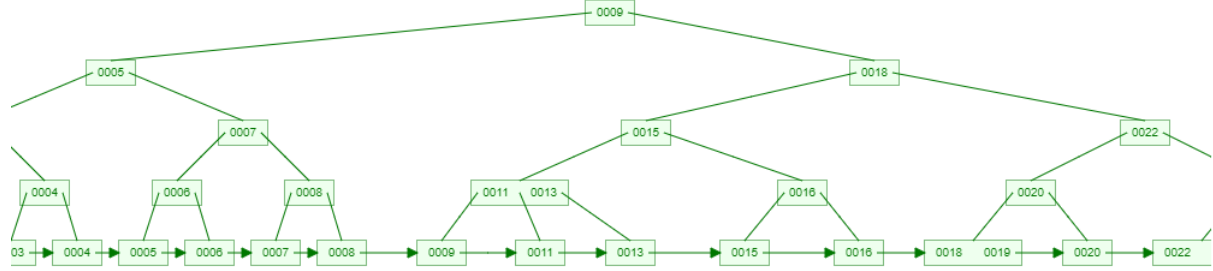
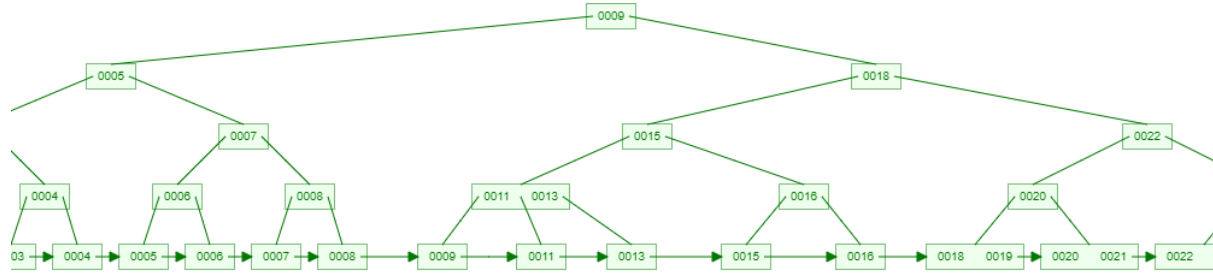
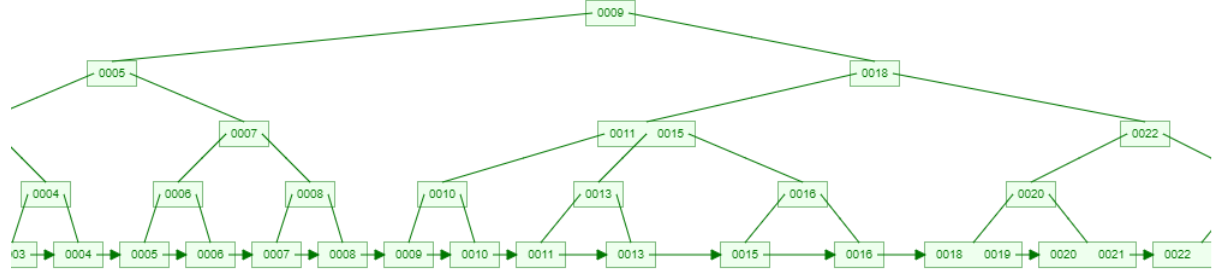
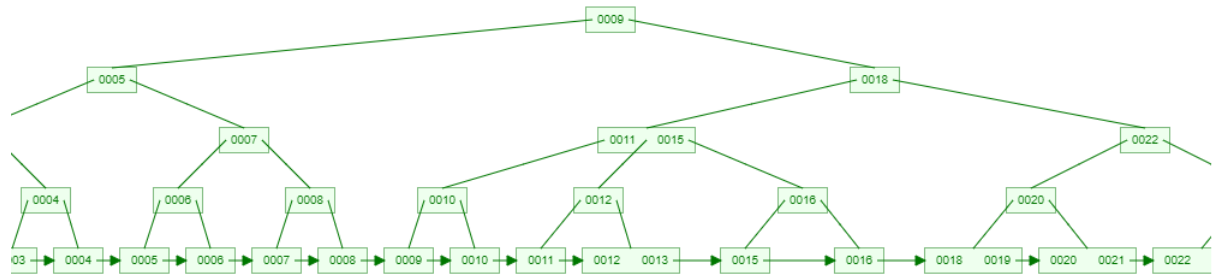
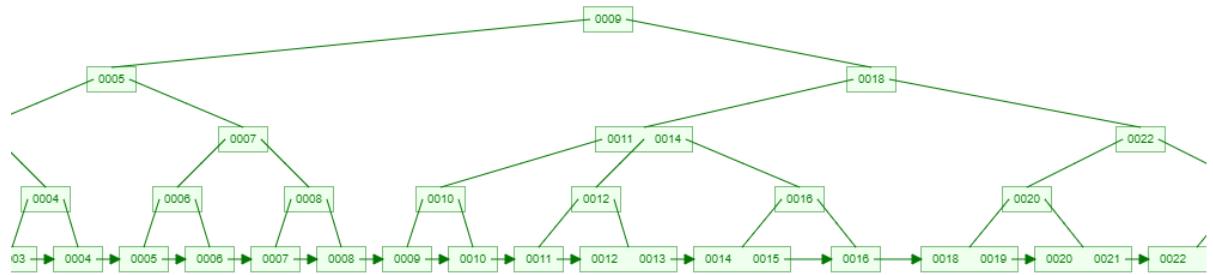


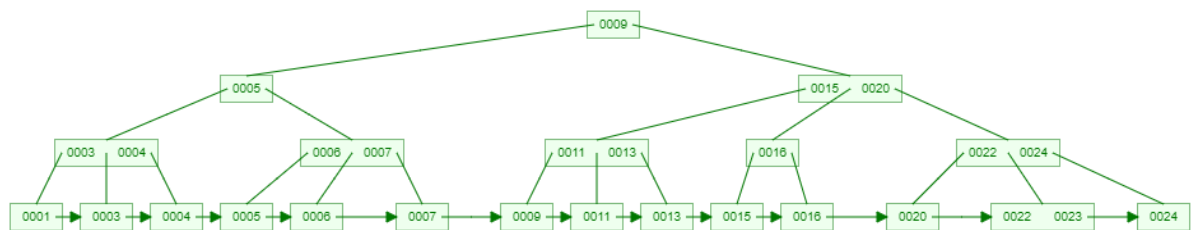
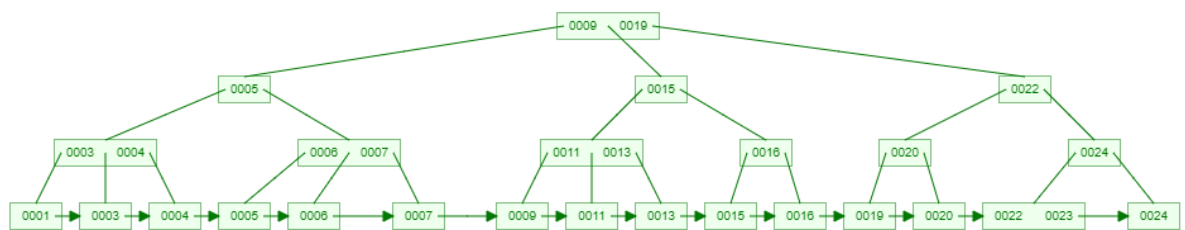
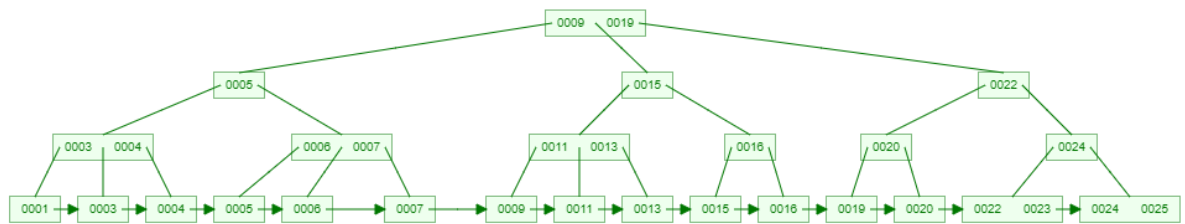
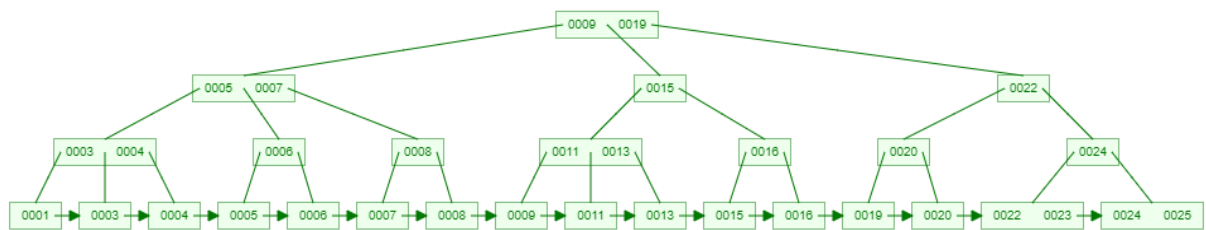






remoção





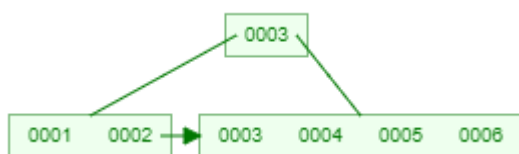
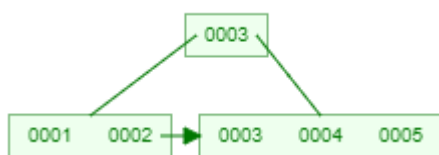
D)

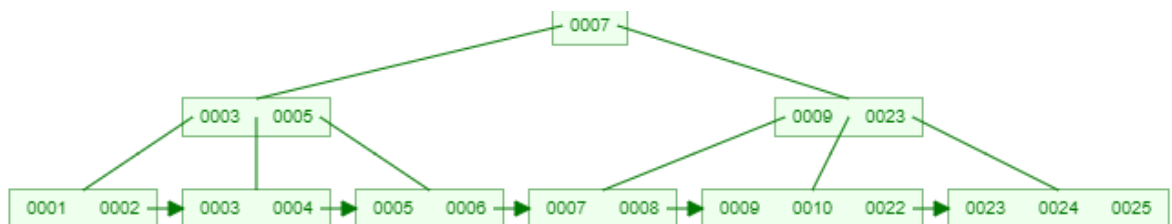
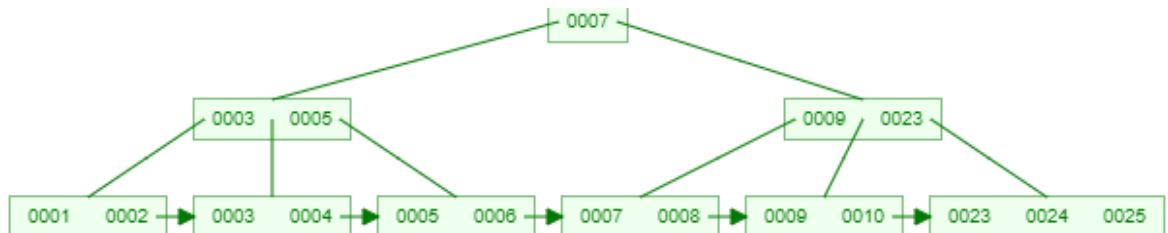
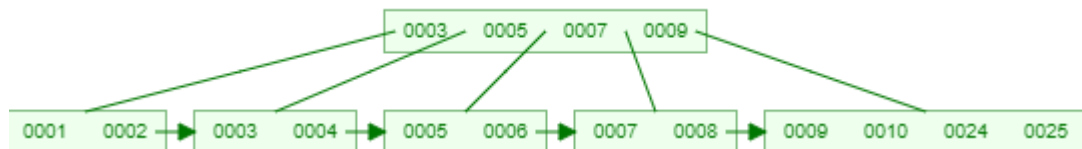
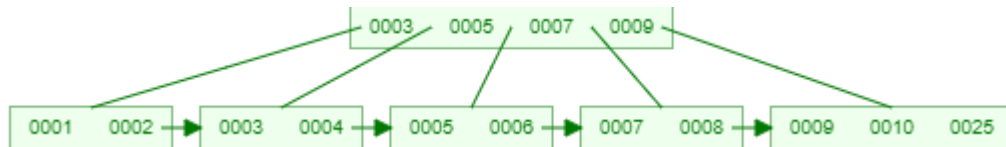
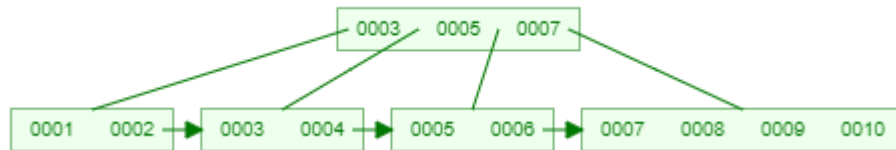
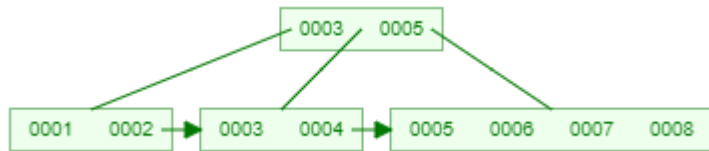
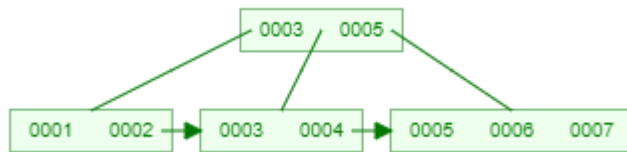
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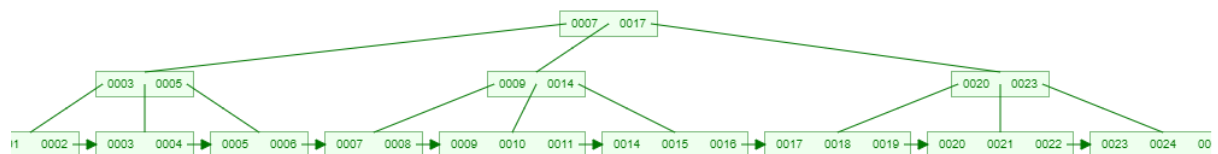
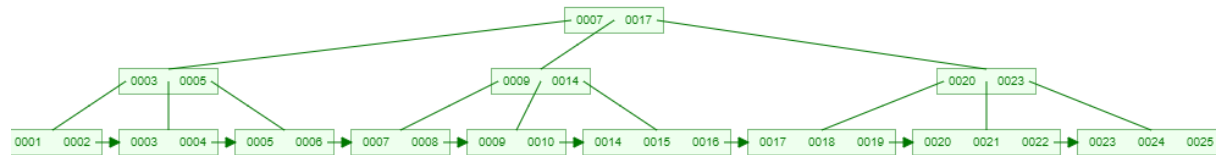
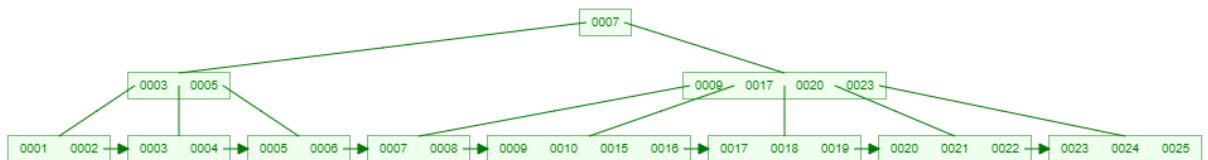
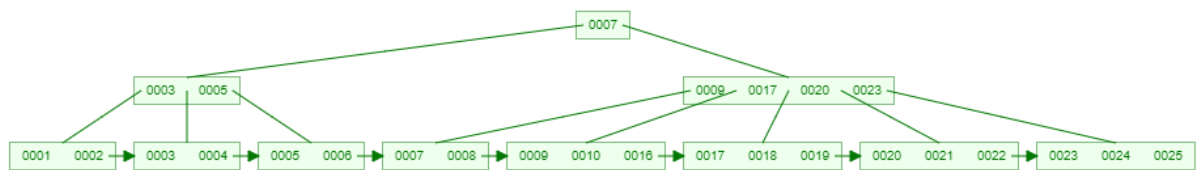
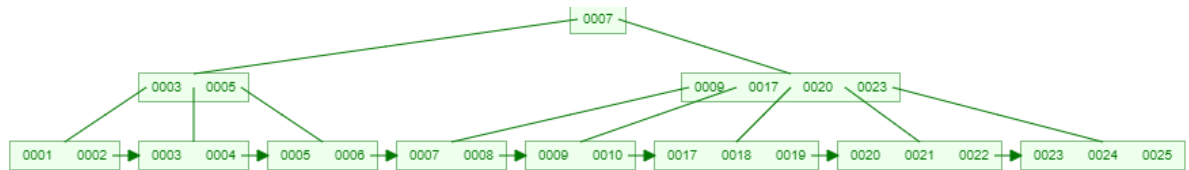
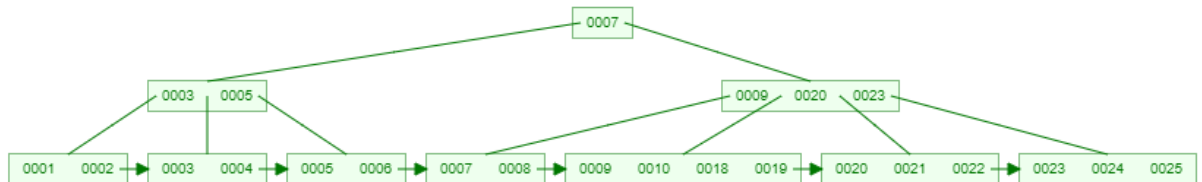
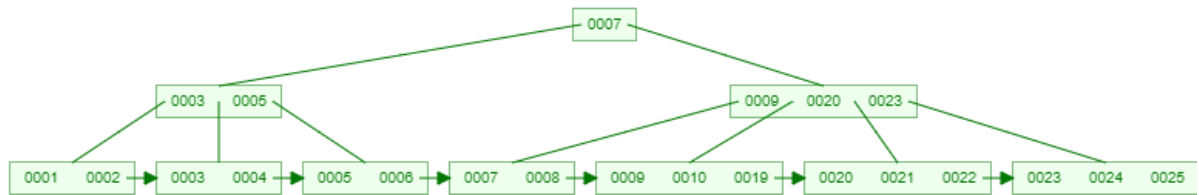
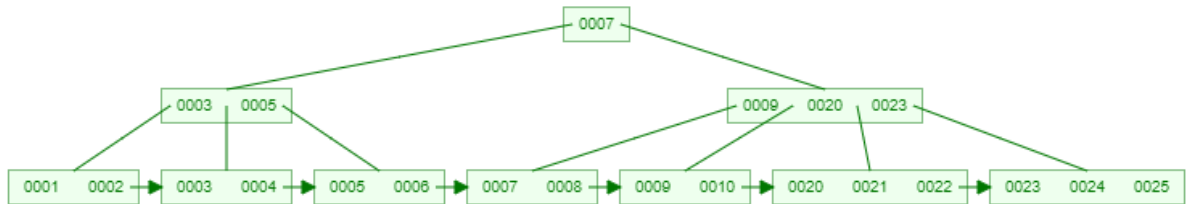
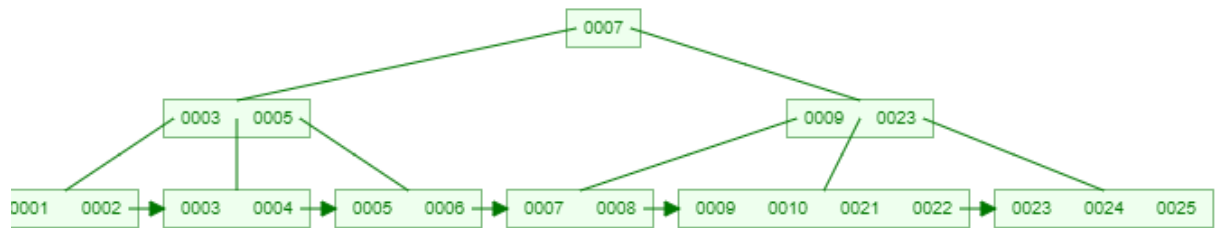
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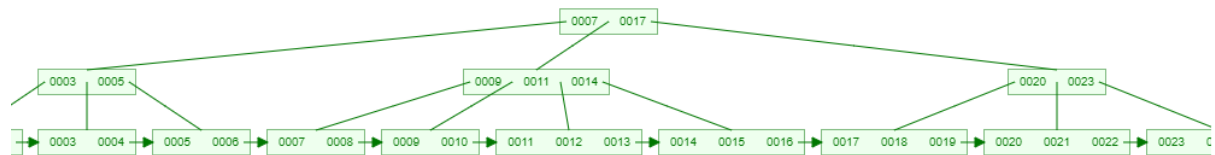
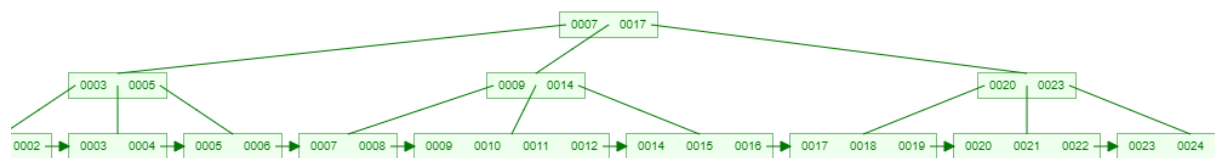
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## Remoção

