21/10/2021

Mid Sem
ADSA - Set - 3

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Q-1

(a) $T(n) = \begin{cases} T(n-5) + n^2 & \text{if } n > 5 \\ 1 & \text{if } n = 0 \end{cases}$

$T(n) = T(n-5) + n^2$

$T(n-5) = T(n-10) + (n-5)^2$

$T(n) = T(n-10) + (n-5)^2 + n^2$

$T(n) = T(n-15) + (n-10)^2 + (n-5)^2 + n^2$

$T(n) = n^2 + (n-5)^2 + (n-10)^2 + (n-15)^2 - \cdots + 1$

$= an^2 + bn + c$

$a = n/5$

$= \frac{n^3}{5} + bn + c$

Hence Time complexity $\equiv O(n^3)$

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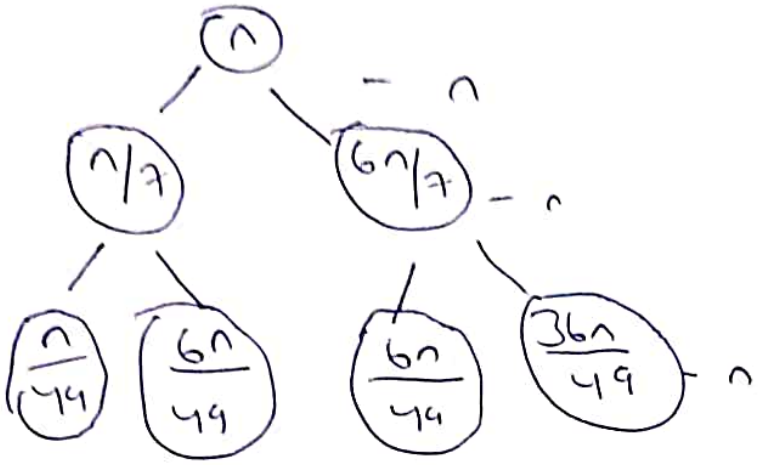
(b)

$$T(n) = T(n/7) + T(6n/7) + n$$



last no of level $= x + 1$

$$(6/7)^x \, n = 1$$

$$(6/7)^x = 1/n$$

$$x \log 6/7 = \log 1/n$$

$$x = \log_{7/6} n$$

No of nodes at last level $= 2^{\log_{7/6} n}$

Total cost of last level $= 2^{\log_{7/6} n} \times T(1)$

$$= O(n^{\log_{7/6} 2})$$

Total cost of all level

$$= \cancel{n \log_{7/6} n} + \cancel{O(n \log_{7/6} 2)}$$

$$= n \log_{7/6} n + O(n^{\log_{7/6} 2})$$

$$= O(n \log_{7/6} n)$$

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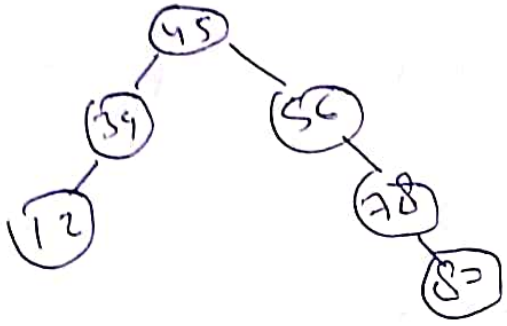
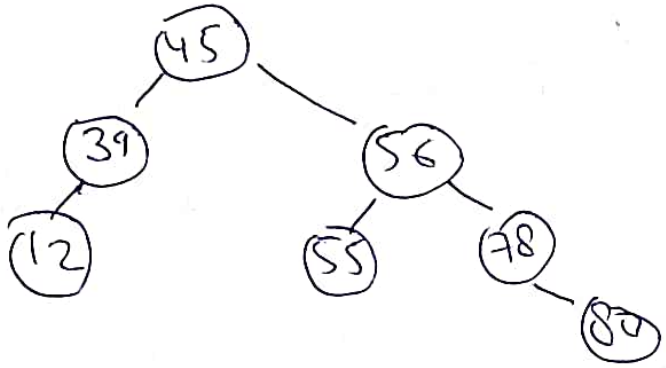
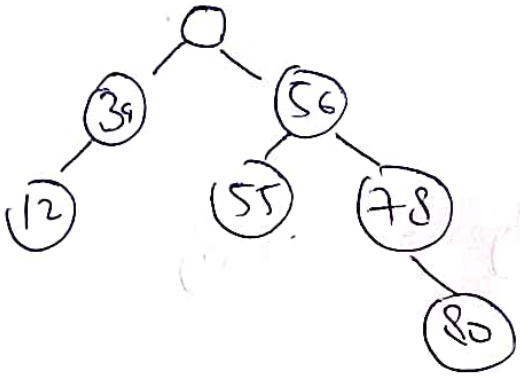
Q.2

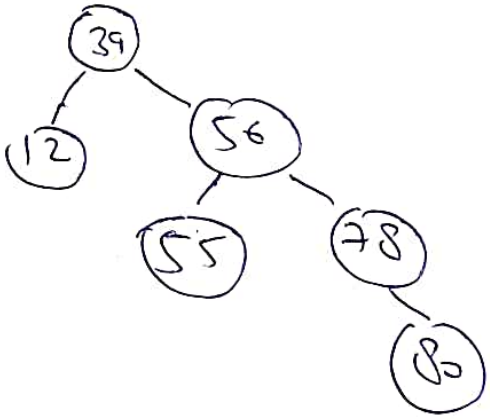


Insert - 55



Delete - 45





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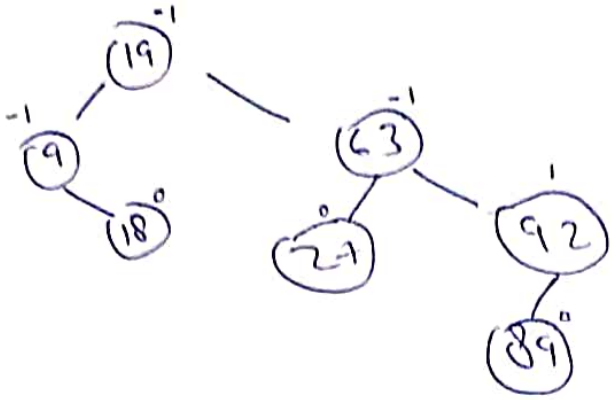
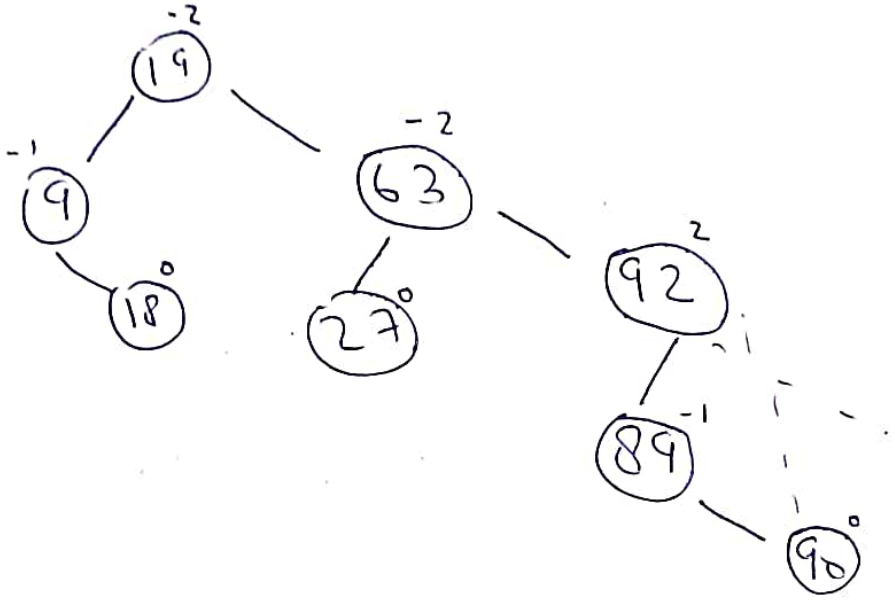
Q-3



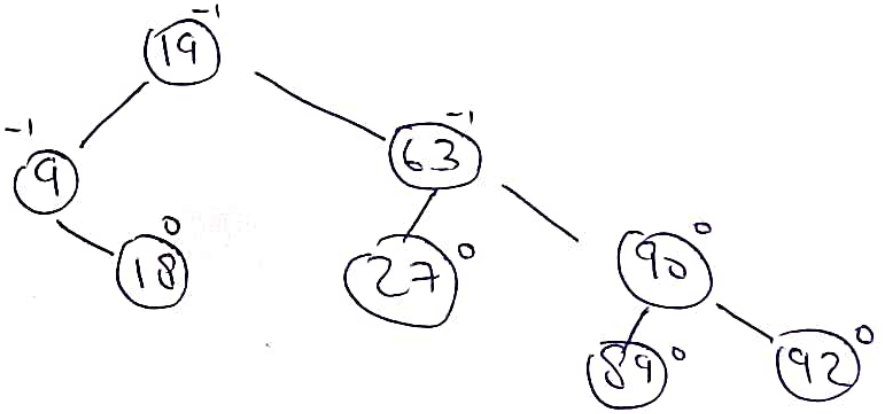
Insert (90)

(a)



Rotation

(b)



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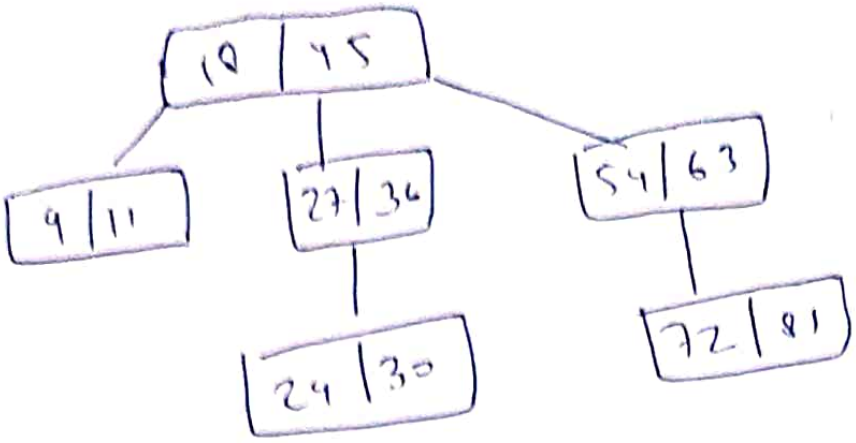
50,25000|=> 37

Q-4



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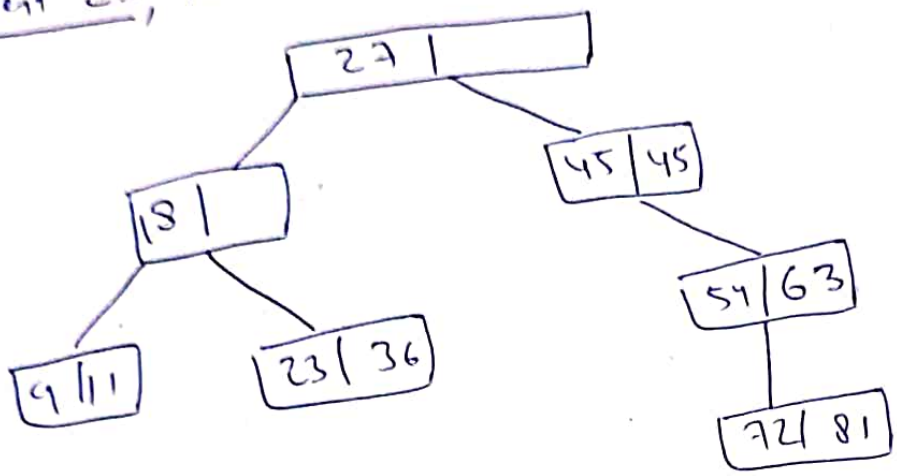
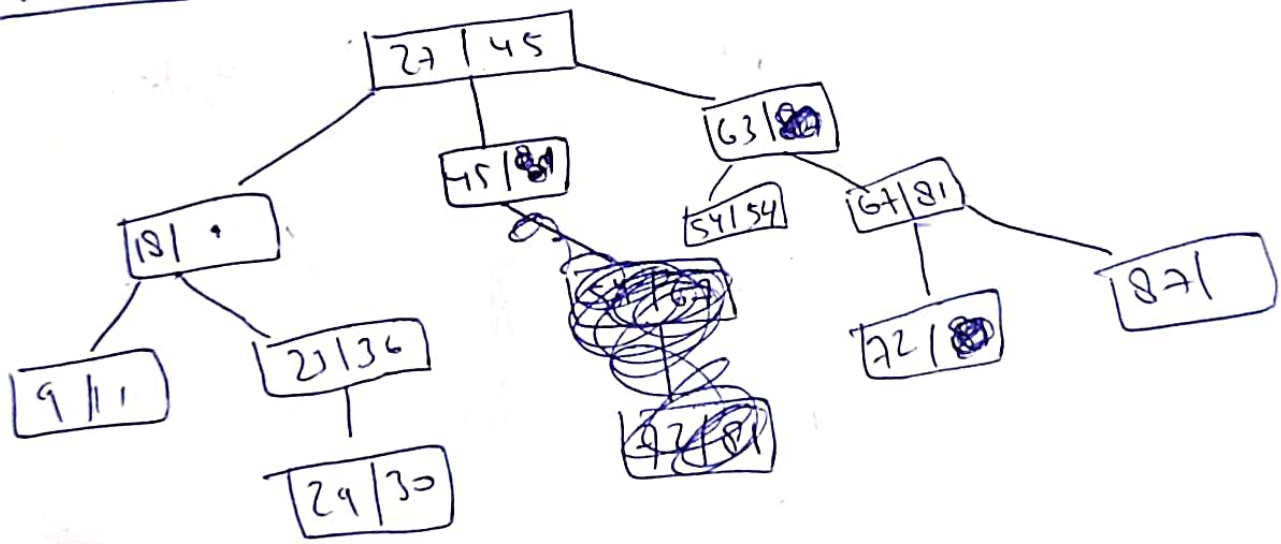


Insert 67, [illegible] 87, 54



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Q-4

Insert 32