**Master’s Theorem**

**T(n) = a T(n/b) + f(n)**

**Where a>=1 and b>1 (constants) then only Master’s theorem can be applied**

**Solution is given as**

**T(n) = n log (base b) a \* [ u(n) ]**

**where u(n) depends on h(n)**

**h(n) = f(n) / n log (base b) a**

**Relation between h(n) and u(n) is given as follows :**

**If h(n) u(n)**

**Case 1 nr where r >0 then O(nr)**

**Case 2 nr where r<0 then O(1)**

**Case 3 (log n) i where i>=0 then (log2 n) i+1 / i + 1**

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**Example 1: T(n) = 8 T( n/ 2) + n 2**

**Solution : Here a = 8 , b = 2 and f(n) = n 2**

**T(n) = n log (base 2) 8 \* u(n) = n 3**

**h(n) = n 2 / n log (base 2) 8**

**= n 2 / n 3**

**= n -1 where r <0 therefore case 2 applies : O(1)**

**T(n) = n 3 . O(1)**

**T(n) = O(n 3)**

**Example 2 : T(n) = 9 T(n/3) + n => O(n2)**

**Example 3 : T(n) = T(2n/3) + 1 => O( log n)**

**a=1 , b= 3/2 , f(n) =1**

**T(n) = n ex( log(base 3/2) 1) = n0 = 1**

**H(n) 1 / 1 = 10 = log n**