**PART 2**

**Solve all the following recurrences.**

1. **T(n) = T(n-1) + n**

Complexity:  n + n-1 + n-2+ ….+1= O(n2)

**2. T(n) = T(n-1) +(n)2**

Complexity:  (n)2 + (n-1)2 + (n-2)2+ ….+(1)2=O(N3)

**3. T(n) = T(n/2) +(n)2**

2nd Master Theorem = O(N2)

**4. T(n) = T(n/2) +n3**

2nd Master Theorem = O(N3)

**5. T(n) = 4T(n/2)+n2**

1st Master Theorem  = Cost \* number of levels = N2 \*  logN => O(N2 log N)

**6. T(n) = 4T(n/2)+n3**

2nd Master theorem = 1st level cost = O(n3)

**7. T(n) = 27T(n/3) + n3**

  1st  Master Theorem =O(n3) \* Number of levels = n3 \* log3n => O(N3 logN)

**8. T(n) = 27T(n/4) + n3**

  2nd Master Theorem =1st level cost = O(n3)

**9. T(n) = 3T(n/3) + n**

 1st Master Theorem = Cost of each level  \*  Number of levels =>O(NlogN)

**10. T(n) = 3T(n/3) + n2**

 2nd Master Theorem applied = 1st level cost => O(n2)

**11. T(n) = 2T(n/2) + 1**

3rd Master Theorem =last level cost=     2log2n => nlog22 => n =>O(n)

**12. T(n) = 2T(n-1) + 1**

3rd Master Theorem = last level cost = O(2n)

**13. T(n) = 2T(n/4) + 1**

  3rd last  Master Theorem = last level cost=2log4n  => O(nlog2)

**14 . T(n) = 4T(n/2)+ n2 log n**

1st Master Theorem = Cost of each level  \*  Number of levels =>    O(N2 log2N)

**15. T(n) = 3T (n/2)+ n**

3rd Master theorem =last level cost=>  O(nlog3)

**16. T (n) = 3T (n/3)+ n/2**

1st Master Theorem= Cost of each level \*  Number of levels  => O(n log n)

**17. T(n) = n1/2 T(n1/2) + n**

 1st Master Theorem = Cost of each level  \*  Number of levels  =>  (N(log(log n)))

**18. T(n) = 3T(n-1) + 1**

3rd Master Therom = last level cost = 30+31+32+.....+3n <= 3.3N   =>O(3n)

**19. T (n) = 3T (n/3)+ n1/2**

3rd Master Theorem = 3Log3N => nLog33  ⇒ N  ⇒  O(N)

**20. T(n) = 2T(n/4) + n1/2**

1st Master Theorem = Cost of each level\*  Number of levels = O( N1/2 logN)     

**21.  T(n) = 7T(n/3) + n2**

2nd Master Theorem=1st level cost = O(n2)

**22.  T(n) = 7T(n/2) + n2**

 3rd Master Theorem=last level cost=7Log2n =>  O(NLog7)

**23.  T(n) = 2T(n/4) + n2**

2nd Master Theorem =1st level cost = O(n2)

**24.  T(n) = T(n-4) + n2**

(1)2+(4)2+(8)2+(12)2+....+(n-8)2+(n-4)2+(n)2= N \* N2 =>O(N3)

**25.  T(n) = 2T(n-4) + n2**

3rd Master Theorem =last level cost=O(2n/4)

**26.  T(n) = T(n-1) + 1/n**   
  
1/n + 1/n-1 + 1/n-2 +...+½ +1/1 =Simple Harmonic Series O(logn)

**27.  T(n) = T(n-1)  + log n.**

log(n \* (n-1) \* (n-2) \* (n-3) \* (n-4)\*.......1)  Log n!

**28.  T(n) = T(n/2) + T(n/4) + T(n/8) + 1     11**

3rd Master Theorem = last level cost= 3Log2n  =>O(nLog3)     

**29.  T(n) = T(n/2) + T(n/4) + T(n/8) + (n)**

2nd Master Theorem = level cost= O(n)

**30.  T(n) = T(n/3)+T(2n/3) + n**

1st Master Theorem applied = Cost of each level  \*  Number of levels =>  O(nlogn)

**31.  T(n) = log n x T(n/log n) + 2n**

1st Master Theorem = Cost of each level  \*  Number of levels => O(Nlog Log N)

**32.  T (n) = 6T (n/3)+ n2 log n**

2nd Master theorem =1st level cost= O(n2Log n)

**33.  T (n) = T(n/4) + 5T(n/5) + T(n/3) + n3**

2nd Master Theorem = level cost =O(n3)

**34.  T (n) = T(n/4) + 5T(n/5) + T(n/3) + n2**

2nd Master Theorem = level cost =O(n2)

**35.  T (n) = T(n/4) + 5T(n/5) + T(n/3) + n**

Log5n < log4n <log3n

3rd Master Theorem applied = last level cost =7log3N   → Nlog37 → O(nlog 7)

**36.  T (n) = T(n/4) + 5T(n/5) + T(n/3) + 1**

 3rd Master Theorem = last level cost= O(nLog7 )  
  
**37.  T(N) = T(n1/2)+ N**

2nd Master Theorem =level cost = O(N)