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**LAB 02: SOLVING RECURRENCE RELATIONS**

## Solve the following recurrence relations with Master theorem

1. CN = CN/2 + 1000

a = 1, b = 2, nk = 1 => k = 0;

=> a = bk

=>

=>

1. CN = 3CN/2 + N

a = 3, b = 2, Nk = N => k = 1;

=> a > bk (3 > 21)

=>

=>

1. C (N) = 2C (N/2) + 1

a = 2, b = 2, nk = 1 => k = 0;

=> a > bk (2>1)

=>

=>

=>

1. CN = 4cN/2 + N

a = 4, b = 2, Nk = N => k = 1

=> a > bk (4 > 2)

=>

=>

=>

1. C (N) = 9C (N/3) + N

a = 4, b = 2, Nk = N => k = 1

=> a > bk (9 > 3)

=>

=>

=>

1. C (N) = C (2N/3) + 1

a = 1, b = 3/2, Nk = 1 => k = 0

=> a = bk

=>

=>

1. C (N) = 3C (N/4) + N2

a = 3, b = 4, Nk = N2 => k = 2

=> a < bk (3 < 16)

=>

=>

h.

=> =

a = 3, b = 3, nk = => k = ½

=> a > bk (3 > )

=>

=>

=>

i.

=> (Ve phai)

=>

a = 3, b = 3, nk = n2.5 => k = 2.5

=> a < bk (3 < 32.5 )

=>

=>

=>

j.

=> (Ve phai)

=>

a = 3, b = 3, nk = n3 => k = 3

=> a < bk (3 < 33 )

=>

=>

=>

k.

=> (Ve phai)

=>

a = 3, b = 3, nk = 1 => k = 0

=> a = bk

=>

=>

k.

=> (Ve phai)

=>

a = 3, b = 3, nk = n2 => k = 2

=> a < bk (3<9)

=>

=>

1. ***Backward***
2. CN = CN/2 + 1000 with N ≥2, C1 = 0

CN/2 = CN/4 + 1000

CN/4 = CN/8 + 1000

….

C2 = C1 = 0

=> C(N) + ~~C(N/2) + C(N/4)~~ + …. C(2) = ~~C(N/2)~~ + 1000 + ~~C(N/4)~~ + 1000 + … + 0

=> C(N) = 1000 + 1000 +…. + 1000 + 0

=> C(N) = (log2(n) – 1)\*1000

=> C(N)

1. CN = 3CN/2 + N with n≥ 2, C1 = 0

C(N/2) = 3C(N/4) + N/2

C(N/4) = 3C(N/8) + N/4

….

C(2) = C(1) + 2 = 0 + 2

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=> 30 CN = 3CN/2 + 30 N

=> 31 C(N/2) = 32 \* C(N/4) + 31 \* N/2

=> 32 C(N/4) = 33 \* C(N/8) + 32 \* N/4

….

3log2(N)-1  \* C(2) = 0 + 3log2(N)-1  \*(N/2log2(N)-1  )

=> 30 CN + ~~3~~~~1~~ ~~C(N/2) + 3~~~~2~~ ~~C(N/4)~~ + … + ~~3~~~~log2(N)-1~~  ~~\* C(2)~~

= ~~3C~~~~N/2~~+ 30 N + ~~3~~~~2~~ ~~\* C(N/4)~~ + 31 \* N/2 + ~~3~~~~3~~ ~~\* C(N/8)~~ + 32 \* N/4 + …. + 0 + 3log2(N)-1  \*(N/2log2(N)-1  )

=> 3C(N) = (3/2)0 N + (3/2)1 N +…..+ (3/2) log2(N)-1  N

=> C(n) = N\*((3/2)0 + (3/2)1 + … + 3/2) log2(N)-1)

=> C(n)

1. C (N) = 2C (N/2) + 1. With N ≥2, C (1) = 0

C (N/2) = 2C (N/4) + 1.

….

C(2) = 2C(1) + 1

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=> 20 C(N) = 21C (N/2) + 20.

=> 21 C(N) = 22C (N/2) + 21.

…..

=> C(N) = C (N/2) + .

=> C(N) = 20 +21 +…. =

=> => C(n) ~

T(n-1) = 5 x T(n-2) +3

….

T(2) = 5T(1) + 3

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50 x T(n) = 51 x T(n-1) + 50 x 3

51 x T(n-1) = 52 x T(n-2) + 51 x 3

…..

5n-2 x T(2) = 5n-1 x T(1) + 5n-2 x 3 = 5n-1 x4 + 5n-2 x 3

=> T(n) = 50 x 3 + 51 x 3 …. + 5n-2 x 3 + 5n-1 x4

=> T(n) = 3 x (50 + 51 + …5n-2 ) + 5n-1 x4

=> T(n)