

Name : Ibrar

Roll No : 19P-0104

IS(CS) : Section (4A)

Design & analyze of Algo Assignment #2

Using Master Theorem:

(Q:1)

$$T(n) = 4T(n/2) + n$$

$$a=4, b=2, f(n)=n$$

$$T(n) \Rightarrow n \log_b a = n \log_2 4$$

$$= n^2 = O(n^2)$$

Let $\epsilon = 1$

Put value of ϵ , we get

$$n^{2-1} = \boxed{n}$$

$$(f(n)=n) = n$$

So we can say that running time
of $T(n)$ is $O(n^{\log_b a}) = O(n^2)$

Q: 2

$$T(n) = 4T(n/2) + n^2$$

$$a=4, b=2, f(n) = n^2$$

$$T(n) = n^{\log_b a}$$

$$T(n) = n^{\log_2 4} = \boxed{n^2}$$

$$(f(n) = n^2) = n^2$$

So we can say that

running time of $T(n)$ is

$$O(n^{\log_b a} \log n) = O(n^2 \log n)$$

Q: 3

$$T(n) = 4T(n/2) + n^3$$

$$a=4, b=2, f(n) = n^3$$

$$T(n) = n \log_b a$$

$$= n \log_2 4 = n^2$$

Let $\epsilon = 1$

$$n^{2+\epsilon} = n^3$$

$$(f(n) = n^3) = n^3$$

also

$a f(\frac{n}{b}) \leq c f(n)$ for large n

as $f(n) = n^3$, let $c = \frac{4}{8}$

$$4 \frac{n^3}{8} \leq \frac{4}{8} n^3$$

$$\frac{4}{8} n^3 \leq \frac{4}{8} n^3$$

$$\frac{1}{2} n^3 \leq \frac{1}{2} n^3$$

equally is prove, so $T(n) = O(n^3)$

$Q: 4$

$$T(n) = 2T(n/4) + n^{1/2}$$

$$a=2, b=4, f(n) = n^{1/2}$$

$$T(n) = n \log_b a$$

$$= n \log_4 2$$

$$= n^{1/2}$$

$$(f(n) = n^{1/2}) = n^{1/2}$$

So running time of $T(n)$
is $O(n^{\log_b a} \log n)$

$$T(n) = (n^{1/2} \log n)$$

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