Nome: Felipe Braz Marques
Matrícula: 22.1.4030

1) multiply(1001, 0110)
$n=4$, $XL=10$, $XR=01$, $YL=01$, $YR=10$

multiply(XL, YL) => multiply(10, 01)
$n=2$, $XL=1$, $XR=0$, $YL=0$, $YR=1$

multiply(XL, YL) => multiply(1, 0)
$n=1$, return $1.0=0$

multiply(XR, YR) => multiply(0, 1)
$n=1$, return $0.1=0$

multiply(XL+YR, YL+YR) => multiply(1+1)
$n=1$, return $1.1=1$
return $0.2^2+(1.0.0)^2 \; 2^{2.2}+0=2=10$

multiply(XR, YR) => multiply(01, 10)
$n=2$, $XL=0$, $YR=1$, $YL=1$, $YR=0$

multiply(XL, YL) => multiply(0, 1)
$n=1$, return $0.1=0$

multiply(XR, YR) => multiply(1, 0)
$n=1$, return $1.0=0$

multiply(XL+XR, YL+YR) => multiply(1, 1)
$n=1$, return $1.1=1$
return $0.2^2+(1.0-0)^2+0=2=10$

multiply(XL+YR, YL+YR) => multiply(11,11)
$n=2$, $XL=1$, $YR=1$, $YL=1$, $YR=1$

multiply(XL,YL) => multiply(1,1)
$n=1$, return $1.1=1$

multiply(XR, YR) => multiply(1,1)
$n=1$, return $1.1=1$

multiply(XL+XR, YL+YR) => multiply(10,10)
$n=2$, $XL=1$, $XR=0$, $YL=1$, $YR=0$

multiply(XL, YL) => multiply(1,1)
$n=2$, return $= 1^2 . 1 = 1$

multiply(XR, YR) => multiply(0,0)
$n=1$, return $0.0=0$

multiply(XL+XR, YL+YR) => multiply(1,1)
$n=1$, return $1.1=1$
return $1.2^2 (1-1-0) 2^{2/2}+0=4=100$
return $1.^1 2^2+(100-1-1) 2^{2/2}+1=9=100$
return $10^\circ 2^4+(100-10-10) \cdot 2^{4/2}+10^2=54=110\ 110$

2) a) $T(n)=aT([n/b]+O(n^d)$

$5T\left(\frac{n}{2}\right)+O(n)$

$a=5$ $b=2$ $d=1$

Pelo teorema mestre:
$\log_2 5 > 1$

Concluimos que:
$O(n^{\log_2 5})$

b) $2T(n-1)+O(1)$

$2^2T(n-2)+2\,O(1)$

$2^kT(n-k)+\sum_{i=0}^{k-1} 2^i * O(1)$

$T(n-k)=1 \Rightarrow k=n-1$

$T(n)=2^{n-1} * T(1)+\sum_{i=0}^{n-2} 2^i * O(1)$

$T(n)=2^{n-1} * O(1)+2^{n-1}-1 * O(1)$

$T(n)=O(2^{n-1})+O(2^{n-1}-1)$

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

c) $9T\left(\frac{n}{3}\right)+O(n^2)$

$a=9 \quad b=3 \quad d=2$

Pelo teorema mestre:

$\log_3 9 = 2$

Com isso concluímos que: $O(n^2 \cdot \log n)$

Fazendo análise dos resultados obtidos, eu escolheria o algoritmo (C), pois possui o menor tempo de execução.