1. a. red, green, blue 8 bits = 1 bytes.

$1280 \times 1024 = 1310,720$ pixels

$1310,720 \times 3 \times 1 = 3,932,160$ bytes / frame

b. $3932160 \times 8 = 31,457,280$ bits / frame

$31457280 / 100,000,000 = 0.3145728$ (s)

2.

P_1 CPU Clock Cycles. ~~$(0.1\times10^6) + (0.2\times2\times10^6) + (0.5\times$~~

$(1\times0.1\times10^6) + (2\times0.2\times10^6) + (3\times0.5\times10^6) + (3\times0.2\times10^6) = 2.6\times10^6$

P_1 CPU Time.

$(2.6\times10^6) / (2.5\,GHz) = 1.04$ ms.

P_2 CPU Clock Cycles

$(2\times0.1\times10^6) + (2\times0.2\times10^6) + (2\times0.5\times10^6) + (2\times0.2\times10^6) = 2\times10^6$.

P_2 CPU Time.

$(2\times10^6) / (3\,GHz) =$ ~~666.67 ns~~ 0.6667 ms.

So CPU P_2 is faster.

(a) P_1 CPU $\frac{2.6\times10^6}{10^6} = 2.6$

P_2 CPU $\frac{2\times10^6}{10^6} = 2$.

(b). P_1 clock Cycles 2.6×10^6.

P_2 clock Cycles 2×10^6.

3.

$$\begin{cases} 90\text{ W} \\ 3.6\text{ GHz} \\ 1.25\text{ V} \end{cases} \Rightarrow \quad 90 = C\cdot(1.25)^2\cdot(3.6\cdot 10^9)$$

$$C = 1.6\times 10^{-8}\text{ Farads.}$$

a.

$$\begin{cases} 40\text{ W} \\ 3.4\text{ GHz} \\ 0.9\text{ V} \end{cases} \Rightarrow \quad 40 = C\cdot(0.9)^2\cdot(3.4\times 10^9)$$

$$C = 1.4524328\times 10^{-8}\text{ Farads.}$$

b. static power 10W $\Rightarrow \frac{10}{10+90} = 0.1 = 10\%$

static power 30W $\Rightarrow \frac{30}{10+40} = 0.4286 = 42.86\%$

$\frac{10}{90} = 0.11 = 11\%$

$\frac{30}{40} = 0.75 = 75\%$

c.

$$\begin{cases} P_i = 10+90 = 100\text{ W} \\ C = 1.6\times 10^{-8}\text{ F} \\ V_i = 1.25\text{ V} \\ f = 3.6\times 10^9 \\ P_f = 90\text{ W} \end{cases}$$

$$\begin{cases} P_i = 70\text{ W} \\ C = 1.4524328\times 10^{-8} \\ V_i = 0.9\text{ V} \\ f = 3.4\times 10^9 \\ P = 63\text{ W} \end{cases}$$

$$\frac{90 - (1.6\times 10^{-8}\times V^2\times 3.6\times 10^9)}{V} = \frac{100 - (1.6\times 10^{-8}\times 1.25^2\times 3.6\times 10^9)}{1.25}$$

$$\frac{90 - 57.6V^2}{V} = 8$$

$$V = 1.182\text{ V}$$

$$\frac{1.25 - 1.182}{1.25} = 0.0544 = 5.44\%$$

$$\frac{63 - (1.4524328\times 10^{-8}\times V^2\times 3.4\times 10^9)}{V} = \frac{70 - (1.4524328\times 10^{-8}\times 0.9^2\times 3.4\times 10^9)}{0.9}$$

$$\Downarrow$$

$$\frac{63 - 49.38V^2}{V} = 33.33$$

$$V = 0.8418\text{ V}$$

$$\frac{0.9 - 0.8418}{0.9} = 0.0651 = 6.51\%$$

4.

(a)

$$\frac{1}{\left(1+0.02\cdot\frac{1}{2}\cdot\frac{3.14\cdot(7.5)^2}{84}\right)^2}$$

$$=\frac{1}{(1+0.02\cdot\frac{1}{2}\cdot 2.104)^2}$$

$$=0.959=95.9\%$$

$$\frac{1}{\left(1+0.031\cdot\frac{1}{2}\cdot\frac{3.14\cdot(10^2)}{100}\right)^2}$$

$$=\frac{1}{(1+0.031\cdot\frac{1}{2}\cdot 3.14)^2}$$

$$=0.909=90.9\%$$

15cm that meaning R = 7.5cm.

20cm that meaning R = 10 cm

(b.)

$$\frac{12}{84\cdot 95.9\%}=0.149$$

$$\frac{15}{100\cdot 90.9\%}=0.165$$

(c) that meaning we need recompue the. Area. and Yield.

$$\frac{2.104}{1.1}=1.913\,cm^2$$

$$\frac{3.14}{1.1}=2.855\,cm^2$$

$$\frac{1}{(1+(1.155)(0.02)\frac{1}{2}\cdot 1.913)^2}=0.957$$

$$\frac{1}{(1+(1.155)\,0.031\cdot\frac{1}{2}\cdot 2.855)^2}=0.905$$

(d.) die area $=\frac{1}{\sqrt{Yield}}-1$

$$\frac{1}{\sqrt{0.92}}-1=0.0426\ \text{defects}/cm^2$$

$$\frac{1}{\sqrt{0.95}}-1=0.0260\ \text{defects}/cm^2$$

5.

V_{x1}	V_{x2}	A	Vf
0	0	1	1
0	1	1	1
1	0	1	1
1	1	0	0