Gabriel Emerson gte0002 Power HW1 Due 4/4

1) Vdd = 1V f = 1GHz P = 5W

2 cores Vdd = 0.7V f = 0.7GHz

a.) $P = 5 \cdot 0.7^2 \cdot 0.7 = 1.715W$

b.) $P = 2 \cdot 1.715 = 3.43W$

c.) throughput = $f \times n = 1 \times 10^9 \times 1 = 1 \times 10^9$

d.) throughput = $2 \cdot 0.7 \times 10^9 = 1.4 \times 10^9$

e.) $C V_{DD}^2 f \cdot t \rightarrow 5 \cdot 1 \cdot 3000s =$ **15,000 J**

f.) $= 5 \cdot 0.7^2 (1)(300) =$ **7350 J**

2.) single: Vdd = 1V f = 1 P = 1

Dual: ½ size Vdd = 0.7 f = 0.7

a.) $P = \frac{1}{2} 0.7^2 \cdot 0.7 \cdot 2 = 0.343$ $1 - 0.343 = 0.657$ **65.7%**

b.) $= \frac{1}{2} \cdot 0.7^2 = 0.245$ $1 - 0.245 = 0.755 \rightarrow$ **75.5%**

c.) throughput = $fn = 0.7 \cdot 2 = 1.4$ $\frac{1.4 - 1}{1} = 0.4 \rightarrow$ **40%**

3.) From 2b) energy required = 0.245

$10\,Whr \cdot 0.245 = 2.45\,Watts \cdot hour$

4.) From 2c.) % change = 1.4

$100 \cdot \frac{1}{1.4} = \boxed{71.43s}$

5.) From 3 2.45 Watt·hour - the same amount of energy is consumed

6.) From 4: $\frac{71.43s}{2} = \boxed{35.72s}$