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Midterm Exam CSC656

1. a) capacitive load of Pentium 4:

$$\frac{2 \times \text{Power}}{(\text{frequency} \times \text{voltage}^2)} \Rightarrow \frac{2 \times 90}{(3.2\times10^9 \times 1.5^2)} = 2.5 \times 10^{-8}$$

$$= \boxed{25 \times 10^{-9}}$$

capacitive load of Ivy Bridge:

$$\frac{2 \times 30}{(3.5\times10^9 \times 0.9^2)} = \frac{60}{(3.5\times10^9 \times 0.9^2)} = 2.12 \times 10^{-8}$$

$$= \boxed{21.2 \times 10^{-9}}$$

b) Pentium 4:

Total Power Dissipated => 90W + 10W = 100W

$$\frac{\text{Static}}{\text{dissipated}} = \frac{10}{100} = 0.1 \times 100\% = \boxed{10\%}$$

static Power ratio to dynamic:

$$\frac{10}{90} = \boxed{0.11}$$

for Ivy Bridge:

total power dissipated:

$$20W + 30W = \boxed{50W}$$

$$\frac{\text{Static}}{\text{dissipated}} = \frac{20}{50} = 0.4 \times 100\% = \boxed{40\%}$$

Ratio: $\frac{20}{30} = \boxed{0.66}$

2. a) $(63.25)_{10}$

i)

$63/2 = 31$ R1 $\qquad 0.25 = 0.01$

$31/2 = 15$ R1

$15/2 = 7$ R1

$7/2 = 3$ R1

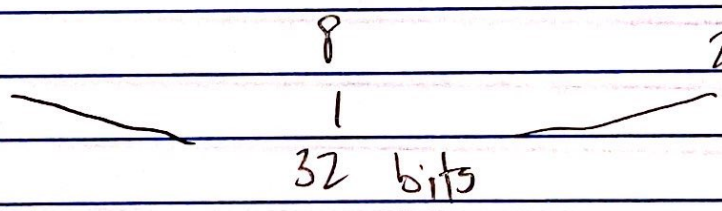
$3/2 = 1$ R1

$1/2 = 1$ R0

$(63.25)_{10} = (111111.01)_2$

Normalized: $(63.25)_{10} = (1.111101)_2 \times 2^5$

Sign (S) Exponent (E) mantissa (M)



$E = 5 + 2^{8-1} - 1 = 5 + 127 = (132)_{10}$

$(132)_{10} = (10000100)_2$

adjust M to 23 bits

M = 1.11111010000000000000000

S	E	M
0	10000100	11111010000000000000000

2. a) IEEE 754 Double precision

(ii)

Sign (S)	Exponent (E)	Mantissa (M)
1	11	52

64 bits

Positive Sign = 0

Unadjusted Exponent = 5

Mantissa = 1.1111101

Adjusted Exponent $E = 5 + 2^{11-1} - 1 = (5 + 1023) = (1028)_{10}$

$E = (1028)_{10} = (10000000100)_2$

M Normalized

M = 1.11110100000000000000000000000000000000000000000000

S	E	M
0	10000000100	1111 1010 (0000 ×11)

4. 0x0C000000

0 = 0000
C = 1100

Binary:
0000 1100 0000 0000 0000 0000 0000 0000

000011 | 00 0000 0000 0000 0000 0000 0000

MIPS: JAL 0