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1.6)

$$CPU\ time = \frac{CPU\ clock\ cycles}{Clock\ rate}$$

$$CPU\ clock\ cycles = \sum_{i=1}^{n}(CPI_i + C_i)$$

Class A = 10^5

Class B (20%) = 2(10^5)

Class C (50%) = 5(10^5)

Class D (20%) = 2(10^5)

CPI clock cycles P1 = 10.4∗10^(-4) ∗2.5∗GHz= 2.6 * 10^6

CPI clock cycles P2 = 6.66∗10^(-4) ∗3∗GHz= 2 * 10^6

CPU P1 time = 1.04 ms

CPU P2 time = 666.67 ns

P2 is faster.

A.

CPI clock cycles P1 = (2.6 * 10^6)/ 10^6 = 2.6

CPI clock cycles P2 = (2 * 10^6)/ 10^6 = 2

B.

P1 = 2.6 * 10^6 clock cycles

P2 = 2 * 10^6 clock cycles

1.9.1)

$$Execution\ time = \frac{CPU\ clock\ cycles}{Clock\ rate}$$

1 processor = 9.6 seconds

2 processors = 7.04 seconds

Relative speed-up over 1 processor: 1.36

4 processors = 3.84 seconds

Relative speed-up over 1 processor: 2.5

8 processors = 2.24 seconds

Relative speed-up over 1 processor: 4.29

1.9.2)

1 processor = 10.88 seconds

2 processors = 7.95 seconds

4 processors = 4.30 seconds

8 processors = 2.56 seconds

1.9.3)

CPI(load /store) = 3

1.12.1)

P1 time = 1.125sec

P2 time = 0.25sec

Even though P2 has a slower clock speed, it preforms faster than P1

1.12.2)

P1 time (10^9 instructions) = 0.225sec

P2 time (instructions in 0.225sec) = 0.225(3∗109) 0.75 = 0.9∗10^9 instructions

It takes longer for P2 to execute the same number of instructions as P1

1.14)

50∗10^6 + 110∗10^6 + 80∗10^6 ∗4 + 16∗10^6 ∗2 = 512∗10^6 instructions

Execution time = (512∗10^6)/(2∗10^9) = 0.256 seconds

1.14.1)

If you want to run the program twice as fast, the number of instructions for the CPI of FP would be reduced below 0 which is not possible.

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1.14.2)

The CPI of L/S must be improved by 20% if we want to run the program twice as fast.

1.14.3)

Execution time = (342.4∗106)/(2∗109) = 0.171 sec

Execution time is improved by 33%