EAST WEST UNIVERSITY

Assignment -1

Course Info:

Course Name: Computer Architecture

Course Code: CSE360

Section: 01

Semester: Spring 2023

Course Instructor:

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Exercise : 1.5

(a) $\text{Performance}(P_1) = \frac{\text{clock Rate}}{CPI}$

$= \frac{3\times10^9}{1.5}$

$= 2\times10^9$

$\text{Performance}(P_2) = \frac{\text{clock Rate}}{CPI}$

$= \frac{2.5\times10^9}{1.0}$

$= 2.5\times10^9$

$\text{performance}(P_3) = \frac{\text{clock Rate}}{CPI}$

$= \frac{4\times10^9}{2.2}$

$= 1.81\times10^9$

The processor P_2 result in the highest Performance expressed in instruction per secon.

$\text{Number fo cycles}(P) = \text{Time} \times \text{clock Rate}$

$\text{Number of instructions}(P) = \left(\frac{\text{Number of cycles}}{CPI}\right)$ instructions

$\text{Number of cycles}(P_1) = (\text{Time} \times \text{clock Rate})$

$= 10\times3\times10^9$

$= 30\times10^9$

$\text{Number of instructions}(P_1) = \frac{\text{Number of cycle}}{CPI}$

$= \frac{30\times10^9}{1.5}$

$= 20\times10^9$

$\text{Number of cycles}(P_2) = (\text{Time} \times \text{clock Rate})$

$= (10\times2.5\times10^9)$

$= 25\times10^9$

Number of Instructions P_2 = $\frac{\text{Number of cycles}}{CPI}$

$= \frac{25 \times 10^9}{1.0}$

$= 25 \times 10^9$

Number of cycles (P_3) = (Time × clock Rate)

$= 10 \times 4 \times 10^9$

$= 40 \times 10^9$

Number of instructions (P_3) = $\frac{\text{Number of cycle}}{CPI}$

$= \frac{40 \times 10^9}{2.2}$

$= 18.18 \times 10^9$

consider the old cpu time is 10 second time is decreased by 30%

$\therefore t_1 = \frac{70 \times t}{100} = 0.7t$

CPI is increased by 20%

$CPI = \left(\frac{120 \times CPI}{100}\right)$

$CPI = 1.2 \times CPI$

processor P_1:

$CPI = 1.2 \times CPI$

$= 1.2 \times 1.5$

$= 1.8$

Number of cycles $P_1 = 30 \times 10^9$ [got to be 'b']

Number of instructions $P_1 = 20 \times 10^9$ [got to be 'b']

clock rate $(P_1) = \frac{(\text{Number of instructions} \times CPI)}{\text{Time}}$

$= \frac{20 \times 10^9 \times 1.8}{7}$

$= 5.14$ GHZ

Processor P_2:

$CPI = 1.2 \times CPI$
$= 1.2 \times 1.0$
$= 1.2$

Number of cycle $P_2 = 25 \times 10^9$ [got to be 'b']
Number of instructions $P_2 = 25 \times 10^9$ [got to be 'b']

$$\text{clock rate} = \frac{\text{Number of instructions} \times CPI}{\text{time}}$$

$$= \left(\frac{25 \times 10^9 \times 1.2}{7}\right)$$

$$= 4.28 \text{ GHz}$$

Processor P_3:

$CPI = 1.2 \times CPI$
$= 1.2 \times 2.2$
$= 2.64$

Number of cycles $P_3 = 40 \times 10^9$ [got to be 'b']
Number of instructions $P_3 = 18.18$ [got to be 'b']

$$\text{clock rate} = \left(\frac{\text{Number of instruction} \times CPI}{\text{time}}\right)$$

$$= \frac{18.18 \times 10^9 \times 2.64}{7}$$

$$= 6.85 \text{ GHz}$$ Ans

Exercise: 1.8

$$\text{capacitive loads Processor } c = \frac{2 \times \text{dynamic Power}}{(\text{voltage}^2 \times \text{frequency})}$$

$$= \frac{2 \times 90}{(1.25)^2 \times 3.6 \times 10^6}$$

$$= \frac{1.8}{1.5625 \times 3.6 \times 10^6}$$

2nd,

$$= 3.2 \times 10^{-3} F$$

$$\text{capacitive loads processor } c = \frac{2 \times \text{dynamic Power}}{(\text{Voltage}^2 \times \text{frequency})}$$

$$= \frac{2 \times 40}{(0.9)^2 \times 3.4 \times 10^6}$$

$$= 2.9 \times 10^{-8} F$$

Exercise: 1.10

1st step:

$$\text{Wafer area} = \pi \times (r)^2$$

$$= 3.14 \times \left(\frac{15}{2}\right)^2$$

$$= 176.7\ cm^2$$

$$\text{Die area} = \frac{\text{Wafer area}}{\text{dies per wafer}}$$

$$= \frac{176.7}{84}$$

$$= 2.10\ cm^2$$

$$\text{Yield} = \frac{1}{\{1 + (\text{Defects per area} \times \text{Die area}/2)\}^2}$$

$$= \frac{1}{\{1 + (0.020 \times 2.10/2)\}^2}$$

$$= 0.959$$

2nd step:

Water area $= \pi r^2$

$= 3.14 \times \left(\frac{20}{2}\right)^2$

$= 314\ cm^2$

Die area $= \frac{\text{Water area}}{\text{dies per wafer}}$

$= \frac{314}{100}$

$= 3.14 cm^2$

Yield $= \frac{1}{\{1 + (\text{Defects per Area} \times \text{Die area}/2)\}^2}$

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

$= 0.910$

Exercise : 1.11

clock rate $= \frac{1}{0.333\ ns}$

$= 3 GHz$

$CPI = \frac{3 \times 10^9 \times 750}{2.389 \times 10^{12}}$

$= 0.94$ Ans

Exercise : 1.12

CPU time $= \frac{CPI \times \text{Instruction Count}}{\text{clock rate}}$

$P_1 (cpu) = \frac{0.9 \times 5 \times 10^9}{4 \times 10^9}$

$= 1.125$ sec

$P_2 (cpu) = \frac{0.75 \times 1 \times 10^9}{3 \times 10^9} = 0.25$ sec

IPU time of P_1 (CPU) = 1.125 s greater than the cpu time of P_2 (CPU) = 0.25 s the processor P_2 performs better than the processor P_1.

Therefore even the clock rate of the processor P_1 is greater than the clock rate of P_2, P_2 performs better than P_1 which shows that statement the computer with largest clock rate have the larges performance is false.