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Section: 07

Assignment 2

Q 1

Instruction count Given = 1.0×10^6

the instruction is divided as follows

30% of A

50% of B

10% of C

10% of D

		A	B	C	D
CPI	X box	5	4	2	1
	Play station	7	2	3	6
Instruction for box Xbox and PS		3×10^5	5×10^5	1×10^5	1×10^5

1

Avg CPI for play-station: $(3\times10^5\times 7 + 5\times10^5\times2 + 10^5\times3 + 6\times10^5)$

$= 40 \times 10^5$

Average CPI for X-box: $(3\times10^5\times5 + 5\times10^5\times4 + 2\times10^5 + 10^5)$

$= 38 \times 10^5$

$\therefore$ Avg CPI for Play station : $\frac{40 \times 10^5}{10^6}$

$= 4$

Avg CPI for X box $= \frac{38 \times 10^5}{10^6}$

$= 3.8$

So the Playstation take $(4 - 3.8) = 0.2$ more clock cycles per Instruction than X box.

2

we know, CPU Time $= \frac{\text{~~CPU~~ Cl. Instruction n Count} \times \text{CPI}}{\text{Clock Rate}}$

for Xbox, Clock Rate : 3 GHz $= 3 \times 10^9$ Hz

CPI $= 3.8$

Instruction $= 10^6$

$\therefore$ CPU Time : $\frac{10^6 \times 3.8}{3 \times 10^9} = 1.27 \times 10^{-3}$ seconds

~~$= 1.267 \times 10^6$ milliseconds~~

$= (1.27 \times 10^{-3} \times 10^3)$ milliseconds

$= 1.27$ milliseconds (Ans)

for Playstation, clock rate $= 2.7$ GHz

$= 2.7 \times 10^9$ Hz

$CPI = 4$

Instruction $= 10^6$

$\therefore$ CPU Time : $\left(\dfrac{10^6 \times 4}{2.7 \times 10^9} \times 10^3\right)$ milliseconds

$= 1.48$ milliseconds.

(Ans)

3

Given Reference time : 120 milliseconds

from (2), CPU time for Playstation : 1.48 ms

$\therefore$ Specrations $= \left(\dfrac{120}{1.48}\right)$

$= 81.08$ (Ans)

The Performance of CPU is based on some fixed rules and some software and ~~gen~~ hardware generated stuffs. Among them Algorithm and compiler is software relatable and ISA is hardware relatable which affects the performance of computer.

Algorithm: Algorithm determins the number of ~~App~~ operations to be executed. If the algorithm is optimal then it will operate minimum number of steps, which will produce minimal number of lines in assembly and machine code.

~~Compiler~~ Compiler: The cpu time is measured by the number of instruction the cpu executes. if a program has more instructions, than it will take more clock cycles to execute. Our compiler convert the program into machine languages so it defends how many instructions the compiler will produce for an instruction in the higher level language.

ISA : A poor ISA causes extra coding to be done to carry out operations. The extra coding takes extra time to process so it will hamper the performe.

Ques no 2

CPU Time : 540 s

Instruction count : 1.35×10^{12}

clock cycle time : 0.22 ns

$= 2.2 \times 10^{-10}$

1

we know

$$\text{cpu time} = \text{Instruction count} \times CPI \times \text{clock cycle time}$$

$$\therefore \quad CPI = \frac{\text{CPU time}}{\text{Instruction }\cancel{\text{tim}}\text{ count} \times \text{clock cycle time}}$$

$$= \frac{540}{1.35 \times 10^{12} \times 2.2 \times 10^{-10}}$$

$$= 1.818$$

(Ans)

2

New Instruction count : $1.35 \times 10^{12} + (0.12 \times 1.35 \times 10^{12})$

$= 1.512 \times 10^{12}$

New CPI $= 1.818 + (0.6 \times 1.818)$

$= \cancel{2.908}\ 1.927$

~~New~~ clock cycle time $= 0.22$ ns

$= 2.2 \times 10^{-10}$

$\therefore$ New CPU time : $1.512 \times 10^{12} \times 1.927 \times 2.2 \times 10^{-10}$

$= \cancel{666.95}$

$= 640.99$

$= 641$

$\therefore$ New sepec ratio $= \dfrac{\text{Reference time}}{\text{New CPU time}}$

$= \dfrac{1394}{\cancel{660.95}\ 641}$

$= \cancel{2.10}$

$= 2.17$ (Ans)

Question 3

Execution time : 2100 s

Password generating time : 2100×0.9

$= 1890$

$\therefore T_{(uneffected)} = (2100 - 1890) = 210$

$\therefore T_{improved} = \frac{2100}{5} = 420$

$T_{affected} = 1890$

$\frac{1}{\quad}$

$\therefore$ we know,

$$T_{improved} = \frac{T_{affected}}{+\ factor} + T_{uneffected}$$

$$\therefore 426 = \frac{1890}{n} + 210$$

$$\Rightarrow (426 - 216) = \frac{1890}{n}$$

$$\Rightarrow n = \frac{1890}{216} = 9$$

(Ans)

from (1) we get the factor is 9

so the Modified time of generation the password generation program is,

$$= \frac{1890}{9}$$

$$= 210$$

which take $\left(\frac{420 - 210}{420}\right) \times 100\%$

$= 50\%$ of the whole program

(Ans)

Ques no 9

Given, Multiplicand = $(1011)_2$ = $(11)_{10}$

~~Product~~
Multiplier = $(1001)_2$ = $(9)_{10}$

$\therefore$ Product Initially = $(0000\ \cancel{0110}\ 1001)_2$

Iteration	Multiplicand 1011	Product 00001001
1	1011	1011 1001 01011100
2	1011	00101110
3	1011	00010111
4	1011	1100 0111 01100011

(if last bit of multiplier = 1
Multiplicand + Product MSB)
1 bit Right shift product

(if last bit of multiplier = 0,
1 bit Right shift product)

(As the Multiplier is of 4bit so the loop runs 4 times)

Again $(1011)_2 = (11)_{10}$

$(1001)_2 = (9)_{10}$

$\therefore (9 \times 11) = 99$

the result we get is (01100011)

$= 0\times2^7 + 1\times2^6 + 1\times2^5 + 0\times2^4 + 0\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0$

$= (99)_{10}$

(Proved)