컴퓨터 구조 1번째 과제

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1. Chapter 1) Review Questions 1.7

<explain Moore's law>

Moore's law describes the number of tarnsistor on a chip double every 18 months.

2. Chapter 1) Problems 1.4

<Given the memory contents of ths ISA computer shown below~... Explain what this program does>

1) 08A- 010FA210FB

(1) 010FA

opcode = 01, adress = 0FA, 01 = 00000001 = LOAD M(X)

LOAD M(0FA): Transfer M(0FA) to the AC.

(2) 210FB

opcode = 21, adress = 0FB, 21 = 00100001 = STOR M(X)

STOR M(0FB): Transfer contents of AC to memory location 0FB.

2) 08B- 010FA0F08D

(1) 010FA

opcode = 01, adress = 0FA, 01 = 00000001 = LOAD M(X)

LOAD M(0FA): Transfer M(0FA) to the AC.

(2) 0F08D

opcode = 0F, adress = 08D, 0F = 00001111 = JUMP +M(X, 0:19)

JUMP +M(08D, 0:19): If number in the AC is nonnegative, take next instruction from left half of M(08D).

3) 08C- 020FA210FB

(1)020FA

opcode = 02, adress = 0FA, 02 = 00000010 = LOAD –M(X)

LOAD –M(0FA): Transfer –M(0FA) to the AC.

(2)210FB

opcode = 21, adress = 0FB, 21 = 00100001 = STOR M(X)

STOR M(0FB): Transfer contents of AC to memory location 0FB.

3. Chapter 2) Review Questions 2.4

<Briefly characterize Amdahl's law>

deals with the potential speedup of a program using multiple processors compared to a si ngle processor.

software must be adapted to a highly parallel execution environment to exploit the power o f parallel processing.

4. Chapter 2) Problems 2.1

<Determine the effective CPI, MIPS rate, and execution time for this program>

Instruction Mix: 1)Integer arithmetic = 45, 2)Data transfer = 32, 3)Floating point = 15, 4)Co ntrol transfer = 8.

$\tau = 1/\ 40 \text{ x } 10\text{^}6 = 1/\ 4 \text{ x } 10\text{^ } 7 = 0.25 \text{ x } 10\text{^-}7 = 0.25 \text{ x } 100 \text{ x } 10\text{^-}9 = 25 \text{ x ns} = 25 \text{ ns.}$

CPI = (1 x 0.45) + (2 x 0.32) + (2 x 0.15) + (2 x 0.08) = 0.45 + 0.64 + 0.3 + 0.16 = 1.5 5

MIPS rate = (40 x 10^6) / (1.55 x 10^6) = 25.8...

execution time =instructions number x average CPI x $\tau = 100000 \text{ x } 1.55 \text{ x } 25 \text{ ns} = 10\text{^}5 \text{ x } 1.55 \text{ x } 0.25 \text{ x } 10\text{^-}9 = 0.3875 \text{ x } 10\text{^-}4 = 0.3875 \text{ x } 100 \text{ x } 10\text{^-}6 = 38.75 \text{ x } 10\text{^-}6 = 38.75 \text{ ms.}$

5. Chapter 2) Problems 2.2

<a. Determine the effective CPI, MIPS rate, and execution time for each machine>

(1)

$\tau = 1/200 \times 10^{6} = 1/2 \times 10^{8} = 0.5 \times 10^{-8} = 0.5 \times 10 \times 10^{-9} = 5$ ns

CPI(1) = (8 x 1) + (4 x 3) + (2 x 4) + (4 x 3) x 10^6 / (8+4+2+4) x 10^6 = 2.22

MIPS rate = (200 x 10^6) / (2.22 x 10^6) = 90

execution time =18 x 2.22 x 5 ns = 199.8ns ~= 200 ns

(2)

CPI(2) = (10 x 1) + (8 x 2) + (2 x 4) + (4 x 3) x 10^6 / (10 + 8 + 2 + 4) x 10^6 = 1.91 6 ~= 1.92

MIPS rate = (200 x 10^6) / (1.92 x 10^6) = 104.166 ~= 104

execution time = 24 x 1.92 x 5 ns = 230.4 ns ~= 230 ns

<b. Comments on the result>

machine B has higher MIPS rate than machine A, but machine B needs a long execution ti me than machine A.

(둘을 비교해보면, machine B 가 A 보다 더 높은 MIPS 를 가진다. 하지만, B 의 execution time 은 A 의 execution time 보다 더 오래걸린다.)

6. Chapter 2) Problems 2.3

<a. What is the relative size of the instruction count of the machine code?>

MIPS rate = instruction count / T x 10^6 -> instruction count = T x 10^6 x MIPS rate

 1)I(c) = (12x) x 10^6 x 1 = (12x) x 10^6

 2)I(c) = (x) x 10^6 x 18 = (18x) x 10^6

relative size IBM RS/6000 to the VAX 11/780 = (18x) x 10^6 / (12x) x 10^6 = 1.5

<b. What are the CPI values for the two machines?>

1)MIPS rate = $1 = 5 \times 10^6 / CPI \times 10^6$ -> $CPI = 5$

2)MIPS rate = $18 = 25 \times 10^6 / CPI \times 10^6$ ->$CPI = 1.388 \sim= 1.4$