Computer Architecture Midterm

(1)

a-)

PIPELINING: A processor has the capability to handle multiple instructions simultaneously.

BRANCH PREDICTION : The processor examines the instruction code retrieved from memory and anticipates which branch instructions are probable to be executed subsequently.

DATA FLOW ANALYSIS : The processor analyzes which instructions are dependent on each others results or data, to create an optimized schedule of instructions.

SPECULATIVE EXECUTION : Using branch prediction and data flow analyzes, some processors speculatively execute instructions ahead of ther of their actual appereance in the program execution, holding the results in temporary locations.

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b-) CPI,

Average CPI : 1.95
MIPS : 401

$(1 * 0.65) + (2 * 0.15) + (4 * 0.15) + (8 * 0.05)$

$0.65 + 0.30 + 0.60 + 0.40 = \boxed{1.95}$

MIPS

$\frac{800}{1.95} = 80000/195 \approx \underline{410}$ //

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c-)

$\frac{1}{(1-0.4) + (0.4)} \Rightarrow \frac{1}{0.6 + 0.1} = \frac{1}{0.7} = \frac{10}{7} \approx 1.42$

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(2)

1- Block Interrupts during ongoing processing.
2- Establish Interrupt priorities, higher priority interrupts can interrupt lower priority handlers.

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(3)

1- Centralized
2- Distributed

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(4)

SEQUANTIAL ACCESS : Data is structured into memory units. (Type units)
DIRECT ACCESS : Involves a mutual read-write process. (Disk units)
RANDOM ACCESS : Every addressable memory location has a distinct, hardwired addressing method. (Main Memory)
ASSOCIATIVE : This is a random access type of memory that enables one to make a comparision of desired bit locations within a word for a specified match. (Cache Memories)

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(5) a-) During the execution of a program, memory references by the Processor, for both instructions and data, tend to cluster.

b-) If access word is found in faster memory, defined as a hit.

C-) A dinamic memory cell is simpler and smaller than a static memory cell.

d-) $(0.9 \times 0.01) + (1-0.9)(0.01+0.1) = \frac{9}{10} \cdot \frac{1}{100} + \frac{1}{10} \cdot \frac{11}{100} = \frac{20}{1000} = \boxed{0.02}$ //

e-) $2^k - 1 < M + K$

$2^5 - 1 < 32 + 5 \Rightarrow 31 < 37$ Sec 38 //

$2^6 - 1 < 32 + 6 \Rightarrow 63 > 38$ Ded $k+1 = 7$ // (64)

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(6)

a-) 512/8 = 64k lines.

b-) lines → 64k = $2^6 . 2^{10} . = 2^{16}$ ⇒ 16 bits

main memory → 64M = $2^6 . 2^{20} = 2^{26}$ ⇒ 26 bits

word → 8 byte = 2^3 ⇒ 8bits

$x + 16 + 3 = 26$

$x = 7$ bit

//

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