EE 3755

Spring 2003

Homework #4

<u>Not</u> to be returned; (it will not be graded).

HW#4

1 Consider the "First example computer" presented in class; (see appropriate handouts). Suppose that the controller operates using a clock with period 10 nanoseconds.

(a) How much time is required for fetching, decoding and executing one 32-bit arithmetic instruction with indirect addressing mode?

(b) How much time is required for fetching, decoding and executing a couple of two-address 16-bit instructions located next to each other in the same memory word?

Note: Ignore step 0. Start from step 1.

2 Show in block diagram form the design of a combinational right-shifter that can shift to the right a 64-bit input word A by any shift amount varying between 0 and 63 bits. Inputs to your combinational shifter are the 64-bit word A and a 6-bit word D indicating the shift amount.

3️⃣🔲. Design a circuit that will accept as input the signal coming from an asynchronous push button having a long duration (40 clock periods for example) and will create as an output a synchronous signal of duration 5 clock periods.

4️⃣ Consider the following two binary unsigned numbers: $A = a_5 a_4 a_3 a_2 a_1 a_0$ and $B = b_3 b_2 b_1 b_0$ where a_5 and b_3 are the most significant bits of A and B while a_0 and b_0 their least significant bits. Consider the multiplication $P = A \times B$.

(a) Show the matrix of summends

(b) Draw the diagram of a 6-by-4 unsigned array multiplier.

(c) If the propagation delay through a 2-input AND gate is D_{AND} and the propagation delay through a full adder is D_{FA}, compute the propagation delay through the 6-by-4 unsigned array multiplier.