

國立台灣科技大學九十五學年度碩士班招生試題

系所組別：電機工程系碩士班丙一組

科目：計算機組織

總分 100 分

1. (12%) Assume normalized operands in an arbitrary floating-point number base b . Show algebraically that at most one base b digit left shift is necessary for multiply and at most one base b digit right shift is needed for divide in order to normalize the result before rounding.
2. (a) (7%) How many times does the CPU need to refer to memory when it fetches and executes an indirect-address-mode instruction if the instruction is a computation requiring a single operand?
(b) (7%) What are the advantages and disadvantages of using a variable-length instruction format?
3. (12%) Consider a 32-bit microprocessor, with a 16-bit external data bus, driven by an 8-MHz input clock. Assume that this microprocessor has a bus cycle whose minimum duration equals four input clock cycles. What is the maximum data transfer rate that this microprocessor can sustain? To increase its performance, would it be better to make its external data bus 32 bits or to double the external clock frequency supplied to the microprocessor? State any other assumptions you make, and explain.
4. (12%) In most computers an interrupt is recognized only after the execution of the instruction. Consider the possibility of acknowledging the interrupt at any time during the execution of the instruction. Discuss the difficulty that may arise.
5. (18%) Short Answers
 - (a) Von Neumann Machine
 - (b) RAID
 - (c) Orthogonal instruction set
 - (d) Prove that a 2 input multiplexer is a universal operator (i.e., *functionally complete*).
6. (10%) Using AND, OR, and NOT gates, construct (by drawing) a device with the following properties:
 - 4 input lines
 - 2 output lines
 The 4 input lines should be interpreted as a 4-bit two's complement number N . The values of the two output lines should be set as follows:

Condition	Out1	Out0
$N=0$	0	0
$N<0$	0	1
$N>1$	1	0
$N=1$	1	1



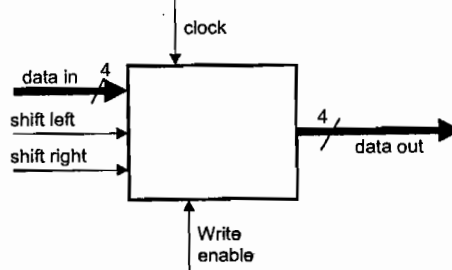
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7. (12%)

- (a) Explain why it is important to use flip-flops rather than latches for registers.
 (b) For multiplication and division, several of the registers used needed to be shifted. From D flip-flops, build a 4-bit shift register, capable of shifting left or right by one bit. From the outside, the register should look like:



8. (10%) Describe the number of bits required in each entry of a TLB that has the following characteristics:
- Virtual addresses are 32 bits wide
 - Physical addresses are 31 bits wide
 - The page size is 2K bytes
 - The TLB contains 16 entries of the page table
 - The TLB is direct-mapped

