

Computer Architecture ECE314

Winter 2005 Test 2

1. Identify the following terms or abbreviations (2 points each)
 - (a) ASM
 - (b) chip select (CS)
 - (c) EEPROM
 - (d) gated clock
2. Explain the difference in how information is stored in dynamic RAM compared to static RAM? (4 points)
3. What additional operation(s) must be performed for dynamic RAM that is not necessary for static RAM? (4 points)
4. Find the value $R1 \leftarrow R2 \text{ sl } 3$ if $R2 = 00101101$. (3 points)
5. How many kilobytes or megabytes of memory are available in a RAM with a 12-bit address and 16-bit output? (4 points)
6. How many 64K * 4 bit RAM chips are necessary in order to construct 4 M * 16 bit memory? (4 points)
7. Describe at least four kinds of memory (or storage) and rank them by capacity and/or access time. (4 points)
8. Give an example of each of the following kinds of microoperations. (3 points)
 - (a) arithmetic
 - (b) logical
 - (c) shift

9. Name and describe the function of the following registers (e.g. ACC is the accumulator) (2 points each)

(a) ACC

(b) PC

(c) IR

(d) MAR

(e) MDR

10. Identify the three states found in the operation cycle of most computers. (3 points)

(a) F _____

(b) D _____

(c) E _____

11. Draw a diagram of a datapath consisting of a register file and a function unit. The function unit accepts bus A and B as inputs and outputs to bus F. Bus F and register MDB (memory data buffer) go to a multiplexor with bus D as output. Bus D provides inputs to the register file. (6 points)

12. What microoperation(s) would you use to transfer the last three bits of R2 into R3? All other bits of R3 should be zero. Express your answer as a register transfer. (2 points)

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13. Given the 16-bit accumulator 0011 1110 1010 0111 what operation must be performed and what operand must be used for the following. Assume bit positions are 15 through 0 from left to right. (2 points each)
 - (a) Clear all even bit positions to 0.
 - (b) Set the leftmost 4 bits to 1.
 - (c) Complement the center 8 bits.
14. Find the ASM chart corresponding to the following description: There are two states, A and B. If in state A and input X is 1, then the next state is A. If in state A and input X is 0, then the next state is B. If in state B and input Y is 0, then the next state is B. If in state B and input Y is 1, then the next state is A. Output Z is equal to 1 while the circuit is in state B. (6 points)
15. Multiply the two unsigned binary numbers 110110 (multiplicand) and 1011 (multiplier). (5 points)
16. Briefly describe the significant features of each of the following types of memory (2 points each)
 - (a) FPM DRAM
 - (b) EDO DRAM
 - (c) DDR SDRAM
 - (d) RDRAM
17. Write an assembly language program to calculate the maximum of the (unsigned) contents of address A, B, and C and store the results in address F. (12 points)

18. What is the hex value in memory address F at the end of execution? Show your reasoning at each step for partial credit. (8 points)

```
Start, Load B
      Add  D
      Store E
      Load A
Loop,  Add  K
      Subt E
      Skipcond 800
      Add  B
      Store F
      Subt C
      Skipcond 000
      Jump Loop
      Halt
A,    Hex 38
B,    Hex 1C
C,    Hex C
D,    Hex 7
E,    Hex 12
F,    Hex 0
K,    Hex 3
```