Instructions

- No calculators or any other electronic devices, except cell phones as noted next.
- Set cell phones to silent mode. You may leave your cell phone on your desk to use as a clock, but you may not use it for anything else, not even checking messages.
- Use pencil, if you have one, rather than ink.
- For multiple-choice questions, circle the letter of the *one best choice* unless the question specifically says to select "all" correct choices.
- There is no penalty for guessing, so answer all questions.
- Place drawings where indicated in the question; be sure to put the question number next to your drawing; use pencil rather than ink.
- Unless otherwise indicated, all questions count equally.
- Partial credit is possible for some questions provided you clearly show your work.

1. Is it a good idea to guess if you don't know the answer to a question?

   A. I read the instructions, and they say there is no penalty for guessing, so it is a good idea.
   B. I read the instructions, and they say there is a penalty for guessing, so it is not a good idea.
   C. I didn't read the instructions, so I don't know, so I'm not answering this question.
   D. I read the instructions, but they didn't say anything about guessing.
   E. Instructions? What instructions?

2. What is the decimal value of 2^{10}? _____
3. What is $log_2(512)$? _____
4. Decimal 123 is 111 1011 in binary.
   What is 123M in binary? _____
5. What do the binary representations of all decimal numbers that are multiples of 4 have in common?

   A. They all start with 4
   B. They are all odd
   C. They all end in 0
   D. They all end in two zeros
   E. They are all less than 1

6. How many picoseconds are there in 100 nanoseconds? _____
7. How many nanoseconds are there in 23 µsec? _____
8. What is the period, in nanoseconds, of a 4 GHz clock? _____
9. What is the frequency of a clock with a 10 nsec period? Be sure to include the correct units suffix: _____
10. (This counts as four questions) On the back of any exam page, write this question number, and:

    A. Write the truth table for segment 2 of a seven-segment display.
    B. Draw the Karnaugh Map for this truth table.
    C. Write the minimized equation for this Karnaugh Map.
    D. Draw a schematic diagram for a circuit that implements the minimized equation. Label all inputs and outputs.

11. What is the purpose of carry-lookahead logic? _____
12. Which *one* of the following statements is the correct with respect to *carry propagate*?

    A. If carry propagate is true, the carry out will be 1.
    B. If carry propagate is true, the carry out will be 0.
    C. If carry propagate is true and if the carry in is 1, the carry out will be 0.
    D. If carry propagate is true and if the carry in is 1, the carry out will be 1.
    E. Carry propagate is true when the carry in is different from the carry out.
    F. If carry propagate is false, the carry out will be 1.

G. If carry propagate is false, the carry out will be 0.

13. What is the bitwise AND of 0x1111 and 0x89AB? _____
14. What is the bitwise OR of 0x1111 and 0x89AB? _____
15. What is the decimal value of the 16-bit two's complement number 0x003F? _____
16. What is the decimal value of the 16-bit two's complement number 0xFFFA? _____
17. What is the 32-bit representation of the 16-bit two's complement number, 0xCAFE?
    _____
18. What is the 32-bit representation of the 16-bit two's complement number, 0xBEEF?
    _____
19. Assume the slide switches are set to 110 011 0110 for Assignment 3.

    A. Name the function being performed: _____
    B. What is the binary value of A? _____
    C. What is the binary value of B? _____
    D. What is the binary value of A'? _____
    E. What is the binary value of B'? _____
    F. What is the binary result of ANDing A' and B'**?** _____
    G. What is the binary result of ORing A' and B'**?** _____
    H. What is the binary result of adding A', B', and C_0? _____
    I. What will be the binary values of the three SLTin pins? _____
    J. What are the binary values of C_2 and C_3? _____
    K. What are the *names* and *values* of the four condition code bits?
    _____
    _____
    _____
    _____
    L. What is the *result* output of the ALU, in binary? _____
    M. What will be displayed in the four seven-segment displays, from left to right? _____

20. Draw a schematic diagram, using only AND, OR, and Not gates, for a 4 × 1 Multiplexer. Label all inputs and outputs meaningfully: