1. Is it all right to use a phone, calculator, or any other electronic device during this exam?
   A. Other people can’t, but I’m different.
   B. Only if the professor isn’t looking.
   C. Yes, as long as the phone is set to vibrate.
   D. iPhones are okay, but Blackberries are not.
   E. No.

2. I am thinking about my birthday. How many yes/no questions would you have to ask me to find out which month I was born in?
   A. 12
   B. 6
   C. At least 3, but possibly 4.
   D. At least 4
   E. \( \log_2(12) \)

3. Now you have to guess everyone’s birth month. What is the average number of yes/no questions you will have to ask everyone?
   A. 12
   B. 6
   C. \( r \log_2(12) \)
   D. \( \log_2(12) \)
   E. \( \log_2(2^{12}) \)

4. If someone says, “A is two orders of magnitude larger than B,” what is the most reasonable way to interpret this statement?
   A. A is twice as large as B.
   B. A is approximately 100 times larger than B.
   C. A is exactly, or very close to, 200 times larger than B.
   D. A is approximately 2,000 times larger than B.
   E. A is approximately equal to B plus 200.

5. 25 nsec = _____ µsec.
   A. 25,000
   B. 0.025
   C. 25,000
   D. 0.000 025
   E. 2.5
6. What is the period of a 4 GHz signal?
   A. 4,000,000 Hz
   B. $\frac{1}{4}$ sec
   C. $\frac{1}{4}$ msec
   D. $\frac{1}{4}$ µsec
   E. $\frac{1}{4}$ nsec

7. What is the frequency of a signal with a period of 0.5 sec?
   A. 0.5 Hz
   B. 0.5 Hx
   C. 2.0 Hx
   D. 2.0 Hz
   E. 500 msec

8. What is the period of a signal with a period of 50 psec?
   A. 0.050 sec
   B. 0.000 050 sec
   C. 0.000 000 050 sec
   D. 0.000 000 000 050 sec
   E. 0.000 000 000 000 050 sec

9. What is the average of 80 7’s, 10 9’s, 5 4’s, 3 2’s, and 2 5’s? (Remember, no calculators allowed.)
   A. 102.5
   B. 3.9
   C. 0.19
   D. 6.86
   E. 31.4

10. What is the sum of the weights for the weighted average in the previous question?
    A. 270
    B. 100
    C. 686
    D. 314
    E. 98.6

11. What is the rotation speed of a tire that has a period of 100 msec?
    A. 55 MPH
    B. 6,000 KHz
    C. 6,000 RPM
    D. 600 KHz
    E. 600 RPM

12. Ben and Jerry’s stacks ice cream on palettes (wooden platforms) with 16×8 rectangles of half-gallon containers 32 layers high on each palette. How many gallons of ice cream go on a palette? (Hint: there are $2^2$ half gallons in a gallon)
    A. 11
    B. $2^{11}$
    C. 5,280
    D. $2^{56}$
    E. 0.0002
13. A computer monitor is 2,048 pixels wide by 1,024 pixels high. Each pixel of this monitor requires 4 bytes of information to be drawn. What would be the bandwidth needed to supply all the information needed to redraw the entire screen 64 times per second? (bps = bits per sec; Bps = Bytes per sec)
   A. 2^{28} Bps
   B. 2^{32} bps
   C. 512 MBps
   D. 4 Gbps
   E. All of the above

14. The same program is run on computers A and B. Computer A is 1.5 times faster than B. Computer A took 10 seconds to run the program. How long did computer B take?
   A. 5 seconds
   B. 10 seconds
   C. 15 seconds
   D. 20 seconds
   E. 3.8 nsec

15. Write this question number on the back of an exam sheet, and write the truth table for a full adder next to it.

16. Write this question number on the back of an exam sheet, and write the truth table for the function
   \[ y = \overline{a}bc + \overline{a}b\overline{c} + ab\overline{c} + abc \]

17. Write this question number on the back of an exam sheet, and minimize the function from the previous question using a Karnaugh Map. Show all work.

18. Write this question number on the back of an exam sheet, and draw the gates to implement the minimized function from the previous question.

19. This question doesn’t count: I just want to see how many people know the answer. What is a name for the two-variable function with minterms 1 and 2? (Just guess if you don’t know.)
   A. AND
   B. OR
   C. NAND
   D. NOR
   E. XOR

20. Write this question number on the back of an exam sheet, and draw all the AND, OR, and NOT gates to implement a 4x1 multiplexer. Label all inputs and outputs appropriately.

21. Fill in the missing cells in binary for the two-bit adder from Assignment 2.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>Cin</th>
<th>Cout</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
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<td>11</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
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</tr>
<tr>
<td>01</td>
<td>00</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

22. Fill in the missing cells, using hexadecimal for the Result column for the four-bit adder-subtractor from Assignment 3. (Table on next page.)
23. In Assignment 4, the `condition_code[3..0]` array was used for the C, V, N, and Z outputs of the ALU. Use a short phrase to define each:

- `condition_code[3] (C)`
- `condition_code[2] (V)`
- `condition_code[1] (N)`
- `condition_code[0] (Z)`

24. Fill in the missing cells in hexadecimal for the four-bit ALU from Assignment 4. Show your work below the table for possible partial credit. For AND and OR, only the N and Z bits matter for an answer to be considered correct; you can leave C and V at zero for those rows.