

Virginia Tech - ECE 5484 - Summer 2020

Homework 1

Before starting this homework assignment, please be sure that you have completed all of the following activities.

- View the relevant online lectures and read associated sections in the textbook before or while you work on this homework assignment.
- Review the course syllabus. Note the grading policies, including policies for submitting assignments.
- Review the course schedule. Note the due dates for course assignments, including this one.
- Review the Graduate Honor System at <https://graduateschool.vt.edu/academics/expectations/graduate-honor-system.html>. Review the Graduate Honor System Constitution, especially Articles I (Sections 1, 2, and 3), V, VI, VII, VIII, and IX.

Please note the following.

- Solutions must be clear and presented in the order assigned. Solutions must show work needed, as appropriate, to derive your answers. Written answers should be concise, but sufficiently complete to answer the question. Neat hand drawings, where needed, are acceptable. Your final solution for each problem must be easily identified.
- At the top of the first page, include: your name (as recorded by the university); your email address; and the assignment name ("ECE 5484, Homework 1"). Do *not* include your Virginia Tech ID number or your social security number.
- Homework must be submitted as a PDF (.pdf) file with the file name *lastname_firstname_HW1.pdf*, where *lastname* is your last or family name and *firstname* is your first or given name. Submit a single file.
- Submit your assignment using the Assignments area of the class website. You must submit your assignment by 11:55 p.m. on the due date.

Homework 1 consists of the following problems:

Answer the following questions.

1. Answer the following questions:
 - a. Convert 3.7 seconds into milliseconds
 - b. How many nanoseconds are in 3 microseconds?
 - c. How many megabytes (MB) are in 1.3 gigabytes (GB)?
2. In the von Neumann model, explain the purpose of the:
 - a. processing unit
 - b. program counter
3. Briefly explain the three main types of Cloud computing platforms.
4. Convert the following decimal values to unsigned binary representation.
 - a. 28.3125
 - b. 127.0
 - c. 128.0
 - d. 132.5625
 - e. 13.2
5. Convert the following unsigned binary numbers to decimal representation.
 - a. 110.110
 - b. 1.101
 - c. 10111.0111

- d. 11111111
 - e. 1110.01
6. Suppose a computer uses radix-3 (ternary) logic instead of radix-2 (binary) logic to represent unsigned integers.
- a. What is the radix-3 representation of the decimal value 37?
 - b. What is the largest value that can be represented by 6 digits?
 - c. Why do you think that binary logic is much more commonly used than ternary logic? Be brief.
7. Convert the hexadecimal number FEED A BEE to binary.
8. Represent each of the following decimal numbers in binary using 8-bit signed magnitude, one's complement, two's complement, and excess-127 representations:
- a. 35
 - b. -35
 - c. 97
 - d. -97
9. If the floating-point number representation on a certain system has a sign bit, a 4-bit exponent and a 5-bit significand:
- a. What is the largest positive and the smallest positive number that can be stored on this system if the storage is normalized? (Assume no bits are implied, there is no biasing, exponents use two's complement notation, and exponents of all zeros and all ones are allowed.)
 - b. What bias should be used in the exponent if we prefer all exponents to be non-negative? Why would you choose this bias?
10. Answer the following questions about character encoding.
- a. The ASCII code for the letter E is 1000101, and the ASCII code for the letter e is 1100101. Given that the ASCII code for the letter M is 1001101, without looking at Table 2.7, what is the ASCII code for the letter m?
 - b. The EBCDIC code for the letter E is 11000101, and the EBCDIC code for the letter e is 1000 0101. Given that the EBCDIC code for the letter M is 1101 0100, without looking at Table 2.7, what is the EBCDIC code for the letter m?