ICS Assignment 2

Name: _____ ID: _____

1. (C)When we want to store music in a computer, the audio signal must be _____.

   (A) sampled only
   (B) coded only
   (C) sampled, quantized, and the coded
   (D) quantized only

2. (A)When a fractional part is normalized, the computer stores the _____.

   (A) the sign, exponent, and mantissa
   (B) only the exponent
   (C) only the mantissa
   (D) only the sign

3. (D)An image can be represented in a computer using the _____ method.

   (A) vector graphic only
   (B) bitmap graphic only
   (C) Excess system only
   (D) either bitmap or vector graphic

4. (B)A floating-point value after normalization is $(1.0101) \times 2^{-4}$. What is the value of the exponent section in the Excess-127 representation?

   (A) 127 (B) 123 (C) 4 (D) -4

5. (A)How many symbols can be represented by a bit pattern with ten bits?

   (A) 1024 (B) 128 (C) 512 (D) 256

6. A student's grade in a course can be A, B, C, D, F, W(withdraw), or I(incomplete). How many bits are needed to represent the grade?
   Sol:
   $2^n = 7 \Rightarrow n \approx 3$ or $\log_2 7 = 2.81 \rightarrow 3$

7. What steps are needed to convert audio data to a bit pattern?
   Sol:
   The three steps are sampling, quantization, and encoding.

8. Change the following decimal numbers to 16−bit unsigned integers.

   (a) 342

   (b) 41

   Sol:

   (a) $342 = 256 + 64 + 16 + 4 + 2 = (0000\ \ 0001\ \ 0101\ \ 0110)_2$

   (b) $41 = 32 + 8 + 1 = (0000\ \ 0000\ \ 0010\ \ 1001)_2$

9. The following are two's complement binary numbers. Show how to change the sign of the number.

   (a) 11111100

   (b) 01110111

   Sol:
   We change the sign of the number by applying the two's complement operation.

   (a) $11111100 \rightarrow 00000100$

   (b) $01110111 \rightarrow 10001001$

10. Convert the following numbers in 32−bit IEEE format.

    (a) $-2^0 \times 1.10001$

    (b) $+2^3 \times 1.111111$

    Sol:

    (a) $S = 1$
    $E = 0 + 127 = 127 = (01111111)_2$
    $M = 10001$ (plus 18 zeros added at the right to make the number)
    1 01111111 10001000000000000000

    (b) $S = 0$
    $E = 3 + 127 = 130 = (10000010)_2$
    $M = 111111$ (plus 17 zeros added at the right to make the number)
    0 10000010 11111100000000000000

11. Answer the following questions about floating-point representations of real numbers:

    (a) What is normalization necessary?

    (b) After a number is normalized, what kind of information does a computer store in memory?

    Sol:

    (a) Normalization is necessary to make calculations easier.

    (b) The computer stores the sign of the number, the exponent, and the mantissa.

12. If we use a 4−bit pattern to represent the digit 0 to 9, how many bit patterns are wasted?
    Sol:
    $2^4 - 10 = 6$ are wasted.

13. Here is a message in ASCII. What does it say?

01000011	01101111	01101101	01110000
01110101	01110100	01100101	01110010
00100000	01010011	01100011	01101001
01100101	01101110	01100011	01100101
00100001			

Sol:
Change binary to hexadecimal first.

01000011	01101111	01101101	01110000		$(43)_{16}$	$(6F)_{16}$	$(6D)_{16}$	$(70)_{16}$
01110101	01110100	01100101	01110010		$(75)_{16}$	$(74)_{16}$	$(65)_{16}$	$(72)_{16}$
00100000	01010011	01100011	01101001	$\Rightarrow$	$(20)_{16}$	$(53)_{16}$	$(63)_{16}$	$(69)_{16}$
01100101	01101110	01100011	01100101		$(65)_{16}$	$(6E)_{16}$	$(63)_{16}$	$(65)_{16}$
00100001					$(21)_{16}$			

Refer to the lecture on page 38 or textbook appendix A.
$\therefore$ Computer Science!