# Introduction to Computer Science
# Quiz1

**A. Single Choice Questions (3%, 45%)**

1. The _____ model is the basis for today's computers.
   (A) Leibnitz (B) von Neumann (C) Pascal (D) Charles Babbage

2. According to the von Neumann model, _____ are stored in memory.
   (A) only data (B) only programs (C) data and programs (D) neither data nor programs

3. Which of the following representations is erroneous?
   (A) $(10111)_2$ (B) $(349)_8$ (C) $(3AB)_{16}$ (D) 256

4. Which of the following is equivalent to 24 in decimal?
   (A) $(11000)_2$ (B) $(1A)_{16}$ (C) $(31)_8$ (D) None of the above

5. Select the correct format in which a CPU executes an instruction
   (A) Fetch the instruction from memory, decode the bit pattern, perform the action
   (B) Decode the bit pattern, fetch the instruction from memory, perform the action
   (C) Perform the action, fetch the instruction from memory, decode the bit pattern
   (D) There is not particular format in which a CPU executes an instruction, it is random

6. Assume a new Excess system uses 17 bits to represent the exponent section. What is the bias value in this system?
   (A) 17 (B) 16 (C) 65535 (D) 65536

7. For an 8-bit allocation, the smallest decimal number that can be represented in two's complement form is _____.
   (A) -8 (B) -127 (C) -128 (D) -256

8. To un-set (force to 0) all the bits of a bit pattern, make a mask of all 0s and then _____ the bit pattern and the mask.
(A) AND (B) OR (C) XOR (D) NOT

9. If the memory address space is 16 MB and the word size is 8 bits, then _____ bits are needed to access each word.
(A) 8 (B) 16 (C) 24 (D) 32

10. There are _____ bytes in 16 Terabytes.
(A) $2^{16}$ (B) $2^{40}$ (C) $2^{44}$ (D) $2^{56}$

11. Which of the following instructions does not fall in the category of arithmetic/logic instructions?
(A) ROTATE (B) ADDI (C) XOR (D) JUMP

12. In the _____ method for synchronizing the operation of the CPU with an I/O device, a large block of data can be passed from an I/O device to memory directly.
(A) programmed I/O (B) interrupt-driven I/O (C) DMA (D) isolated I/O

13. The _____ layer of the TCP/IP protocol suite provides services for end users.
(A) data-link (B) transport (C) application (D) physical

14. _____ is a protocol for file transfer.
(A) FTP (B) SSH (C) DNS (D) HTTP

15. Which of the following statement about Unicode is <u>not true</u>?
(A) An extended version of the ASCII (B) It contains 256 characters (C) It is designed to be a superset of ASCII (D) Each character is encoded with 4 bytes

**B. Short-answer Questions**

16. Convert each of the following base ten representations to its equivalent two's complement representation in which each value is represented in 8 bits. (6%)

a. -27
b. 21

17. Convert each of the following binary representations into its equivalent base ten representation. (6%)

a. 100.0101

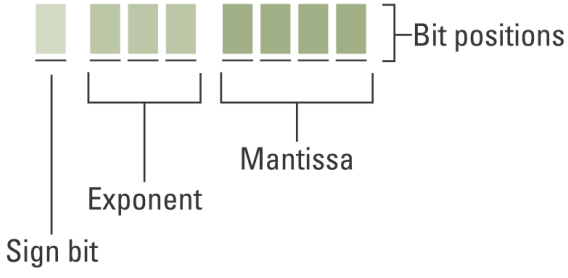
b. 0.1101

18. Perform each of the following additions assuming the bit strings represent values in two's complement notation. Identify each case in which the answer is incorrect because of overflow. (6%)

a. 10111 + 11010

b. 00111 + 01100

19. Assume that we have a system that is similar to the IEEE standard but only uses 8 bit to represent the floating-point where the leftmost bit is the sign bit, the following three bit is exponent stored in Excess_3 system and the final five-bit store the mantissa after normalization as follows: (6%)




Try to use the above representation to represent

a. 6.5

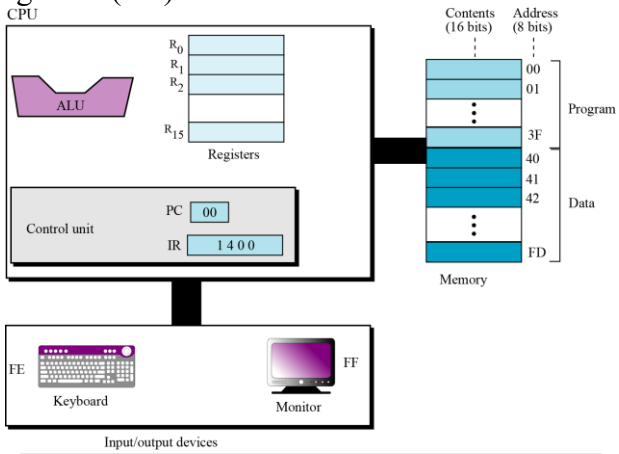
b. 9

20. Write the answer to each of the following logic problems. (6%)

| | | |
|---|---|---|
| 10101010 | 10101010 | 10101010 |
| AND 11110000 | OR 11110000 | XOR 11110000 |

21. Suppose a digital camera has a storage capacity of 500MB. How many black-and-white photographs could be stored in the camera if each consisted of 512 pixels per row and 512 pixels per column if each pixel required one bit of storage? (4%)

22. Given the following table (8%)




| *Instruction* | *Code* | *Operands* | | | *Action* |
|---|---|---|---|---|---|
| | $d_1$ | $d_2$ | $d_3$ | $d_4$ | |
| HALT | 0 | | | | Stops the execution of the program |
| LOAD | 1 | $R_D$ | $M_S$ | | $R_D \leftarrow M_S$ |
| STORE | 2 | $M_D$ | | $R_S$ | $M_D \leftarrow R_S$ |
| ADDI | 3 | $R_D$ | $R_{S1}$ | $R_{S2}$ | $R_D \leftarrow R_{S1} + R_{S2}$ |
| ADDF | 4 | $R_D$ | $R_{S1}$ | $R_{S2}$ | $R_D \leftarrow R_{S1} + R_{S2}$ |
| MOVE | 5 | $R_D$ | $R_S$ | | $R_D \leftarrow R_S$ |
| NOT | 6 | $R_D$ | $R_S$ | | $R_D \leftarrow \overline{R_S}$ |
| AND | 7 | $R_D$ | $R_{S1}$ | $R_{S2}$ | $R_D \leftarrow R_{S1}$ AND $R_{S2}$ |
| OR | 8 | $R_D$ | $R_{S1}$ | $R_{S2}$ | $R_D \leftarrow R_{S1}$ OR $R_{S2}$ |
| XOR | 9 | $R_D$ | $R_{S1}$ | $R_{S2}$ | $R_D \leftarrow R_{S1}$ XOR $R_{S2}$ |
| INC | A | R | | | R ← R + 1 |
| DEC | B | R | | | R ← R – 1 |
| ROTATE | C | R | *n* | 0 or 1 | $Rot_n R$ |
| JUMP | D | R | *n* | | IF $R_0 \neq R$ then PC = *n*, otherwise continue |

Key: $R_S$, $R_{S1}$, $R_{S2}$: Hexadecimal address of source registers
$R_D$: Hexadecimal address of destination register
$M_S$: Hexadecimal address of source memory location
$M_D$: Hexadecimal address of destination memory location
*n*: Hexadecimal number
$d_1$, $d_2$, $d_3$, $d_4$: First, second, third, and fourth hexadecimal digits

write the code for a program that performs the following calculation:

B ← A - 1

A and are integers in two's complement format. The user types the value of A and the value of B is displayed on the monitor.

23. What is the primary difference between using Telnet and SSH to connect to a remote server? (4%)

24. In what way could TCP be considered a better protocol for implementing the transport layer than UDP? In what way could UDP be considered better than TCP? (5%)

25. Considering the following URL https://www.math.nsysu.edu.tw:443/highschool. Identify which part is protocol, host, port and path, respectively. (4%)