一、選擇題：〈40 分，每題兩分〉
1. _____ is a memory type with capacitors that need to be refreshed periodically. (A) DRAM (B) SRAM (C) ROM (D) all of the above
2. A 32-bit code called ______ represents symbols in all languages. (A) ANSI (B) Unicode (C) EBCDIC (D) ASCII
3. For the binary AND operation, only an input of ______ gives an output of 1. (A) two 0s (B) two 1s (C) one 0 and one 1 (D) any of the above
4. A mask can flip the five leftmost bits of an 8-bit pattern. What is the result when the mask is operated on the following pattern 10100110? (A) 01011001 (B) 10111001 (C) 01011110 (D) 10111111
5. How many symbols can be represented by a bit pattern with 10 bits? (A) 128 (B) 256 (C) 512 (D) 1024
6. In a computer, the ______ subsystem accepts data and programs and sends processing results to the outside world. (A) ALU (B) input/output (C) memory (D) control unit
7. In the ______ graphic method of representing an image in a computer, the image is decomposed into a combination of geometrical figures. (A) bitmap (B) vector (C) quantized (D) binary
8. The _____ is a storage device in which the user can write information only once to the disc. (A) CD-R (B) CD-ROM (C) CD-RW (D) all of the above
9. There are ____ bytes in 16 terabytes. (A) \(2^{16}\) (B) \(2^{40}\) (C) \(2^{44}\) (D) \(2^{56}\)
10. ____ can occur if a process has too many resource restrictions. (A) Starvation (B) Synchronization (C) Paging (D) Deadlock
11. A ____ controller is a high-speed serial interface that transfers data in packets. (A) SCSI (B) FireWire (C) USB (D) both B and C
12. In the ____ method to synchronize the operation of the CPU with the 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. Multiprogramming requires a ____ operating system. (A) batch (B) time-sharing (C) personal (D) distributed
14. The ____ manager is responsible for archiving and backup. (A) memory (B) process (C) device (D)
15. We use a ______ search for an unordered list. (A) sequential (B) binary (C) bubble (D) insertion

16. The three steps in executing each instruction of a program on a computer are performed in the specific order _____. (A) fetch, execute, and decode (B) decode, execute, and fetch (C) fetch, decode, and execute (D) decode, fetch, and execute

17. The ______ layer of the TCP/IP protocol suite is responsible for node-to-node delivery of a frame between two adjacent nodes. (A) transport (B) network (C) data-link (D) physical

18. ______ is a protocol for e-mail services. (A) FTP (B) SMTP (C) TELNET (D) HTTP

19. ______ is a program’s code in machine language. (A) A procedure (B) An object program (C) A source program (D) none of the above

20. Java is a(n) ______ language. (A) procedural (B) functional (C) declarative (D) object-oriented

二、綜合題：〈60分，每題10分。有任何計算過程務必寫出，否則不予計分〉

1. If integers are stored in two’s complement format in a computer, how does the computer do the following arithmetic operation? Please use an 8-bit allocation for each integer.
   \[11 - 25\]

2. Show the Excess_127 (single precision) representation of the decimal number 5.75

3. An imaginary computer has sixteen data registers (R0 to R15), 1024 words in memory, and 16 different instructions (add, subtract, etc.).
   a. What is the minimum size of an instruction in bits if a typical instruction uses the following format: \texttt{INSTRUCTION M R}. \texttt{INSTRUCTION} represents one of the 16 instructions, \texttt{M} represents a location of the memory, and \texttt{R} is one of the sixteen registers)
   b. What is the size of the instruction register of this computer?
   c. What is the size of the program counter of this computer?

4. A multiprogramming operating system uses paging. The available memory is 60 MB divided into 15 frames, each of 4 MB. The first program needs 14 MB. The second program needs 11 MB. The third program needs 26 MB.
   a. How many frames are used by the first program?
   b. How many frames are used by the second program?
   c. How many frames are used by the third program?
   d. How many frames are unused?
   e. What is the total memory wasted?

5. Write a recursive algorithm in pseudocode to find the greatest common divisor (gcd) of two integers using the following definition. In this definition, the expression “x mod y” means dividing x by y and using the remainder as the result of the operation.
   \[
gcd(x, y) = \begin{cases} 
    x & \text{if } y = 0 \\
    \gcd(y, x \mod y) & \text{otherwise}
  \end{cases}
\]

6. Rewrite the algorithm, as depicted in figure 1, in pseudocode for the summation of a list of integers.
Figure 1. summation of a list of integers