單選題 (60%)

1. The term _____ , although originally a complimentary word for a computer enthusiast, now has a derogatory meaning and refers to someone who accesses a computer or network illegally.
   A. sucker
   B. spammer
   C. pirate
   D. hacker
   E. cracker

2. The _____ is the main circuit board of the computer.
   A. motherboard
   B. chassis
   C. control unit
   D. processor
   E. USB

3. Buses consist of a data bus and a(n) _____ bus.
   A. address
   B. analog
   C. digital
   D. memory
   E. system

4. Suppose you would like to SQL command to revoke a table definition. Which of the following statement should you use?
   A. REVOKE TABLE
   B. DELETE TABLE
   C. REMOVE TABLE
   D. DROP TABLE
   E. ELIMINATE TABLE

5. Which of the following descriptions about relational database model is correct?
   A. There is an order on the tuples of a relation.
   B. Each tuple in a relation must be unique.
   C. Each attribute in a relation schema may be multi-valued.
   D. Each attribute in a relation schema may be composite.
   E. None of the above is correct.

6. Which of the following does not belong to 3-tier software architecture?
   A. Presentation tier
   B. Business logic tier
   C. Data service tier
   D. Physical tier

7. Consider 8-bit integers. Which of the following is the binary representation of "-5", when using 2's complement?
   A. 10000101
   B. 10000110
   C. 11111010
   D. 11111011
   E. 11111001

8. Which of the following is the result of $0x2a8f \oplus 0xa94e$, where $\oplus$ indicates "exclusive or" ?
   A. 0x83c1
   B. 0x280e
   C. 0xabcf
   D. 0xd3dd
   E. 0x2a8f

9. Which of the following is the result of $0x2a8f + 0xa94e$, where + indicates "addition"?
   A. 0x83c1
   B. 0x280e
   C. 0xabcf
   D. 0xd3dd
   E. 0x2a8f

10. Flash memory chips are a type of _____ , which means they consist entirely of electronic components, such as integrated circuits, and contain no moving parts.
    A. fixed disks
    B. redundant array of independent disks
    C. floppy disk
    D. solid-state media
    E. external hard drives

11. What is the remainder of $2^{100}/10$?
    A. 0
    B. 2
    C. 4
    D. 6
    E. 8

12. Which of the following Operating Systems requires more than one core?
    A. Real-time
    B. Multiprogramming
    C. Time-sharing
    D. Virtual machine
    E. None of the above

13. What is the subnet mask of a Class B with maximum of 32 subnets?
   A. 255.255.248.0
   B. 255.255.252.0
   C. 255.255.255.0
   D. 255.255.255.128
   E. None of the above

14. Which of the following statements is false?
   A. Each I/O device has a device controller and needs a device driver to interact with operating system.
   B. Semaphore is used to do concurrency control between different processes.
   C. I/O devices use a routing mechanism to signal the operating system upon the occurrence of an event.
   D. When thrashing occurs, the operating system will reduce the degree of multiprogramming.
   E. None of the above.

15. Which of the following statements is false?
   A. Both TCP and UDP provide services to higher layer protocols.
   B. Multiple higher layer protocols can be multiplexed onto a single UDP or TCP layer.
   C. Each of these higher layer protocols are then differentiated by means of port numbers.
   D. Port numbers can be pre-defined by network administrators and are therefore referred to as "well known ports".
   E. None of the above.

16. Which of the following statements is false?
   A. Routers with at least one interface in the backbone area are called Backbone Routers
   B. Routers with interfaces within this network but with at least one interface to another administration's network are called Boundary Routers.
   C. Routers within the networks of large organizations often learn about connectivity using link-state protocols, such as SNMP.
   D. Packet forwarding is the task of dealing with moving individual packets.
   E. None of the above.

17. Which of the following statements is false?
   A. HTTP is a push protocol; the server pushes information to the client.
   B. HTTP is a stateless protocol. In other words, the current request does not know what has been done in the previous requests.
   C. HTTP allows systems to be built independently of the data being transferred.
   D. A URL is used to uniquely identify a resource over the web
   E. None of the above.

18. A high-speed network is capable of transmitting 100Mbits per second. Consider a video file of 300 Gbytes. How long does it take to transmit the file without considering the overhead?
    - A. 300 seconds
    - B. 3000 seconds
    - C. 2400 minutes
    - D. 400 minutes
    - E. None of the above.

19. The execution time of J1, J2, and J3 is 24, 3, and 3, respectively. Assume the arrival order of these three jobs is J1, J2, and J3 and their arrival time is the same. What is the average turnaround time if the First-come-first-served scheduling policy is used?
    - A. 13
    - B. 25
    - C. 27
    - D. 10
    - E. None of the above.

20. Which of the following statements is false?
    - A. Deadlock will not happen if all the resources are preemptive.
    - B. Resource allocation graph is used to represent the system state.
    - C. A circle in a resource allocation graph means deadlock.
    - D. Deadlock will slow down the system performance.
    - E. None of the above.

問答題 (40%)

1. Consider the following C function: (10%)

```
int f(double x, double n)
{
        if (n <= 1) /* 測試 n 是否小於等於 1 */
            {print( "error\n" ); exit;} /* 錯誤，程式結束 */
        if (x < n) /* 測試 x 是否小於 n */
            return 0;
        x = x / n;
return (f(x, n)+1);
}
```

    A. What is f(8.5, 2.0)?
    B. Give the mathematical function of f(x, n).

2. Consider the following CPU: (10%)

    Intel E5620 Xeon CPUs at 2.4 GHz,

    Besides, there are three levels of cache, and their performances are as follows:
    - ● L1 Cache hit: 6 cycles
    - ● L2 Cache hit: 24 cycles

- L3 Cache hit: 96 cycles
- Memory: 384 cycles

The probabilities of various cache hits are as follows:
- L1 Cache hit: 60%
- L2 Cache hit: 70%
- L3 Cache hit: 80%

Note that L1 is first checked for a memory access. L2 cache is checked only when L1 cache is missed, L3 cache is checked only when L2 cache is missed. When all three caches are missed, memory access is conducted. What is the average time for a memory access? Please show how you compute it.

3. Assuming a physical memory of four pages, give the number of page faults for the reference string *abgabdecabadecgde* for each of the following policies. (Initially, all frames are empty.) (10%)
   A. Optimal page replacement
   B. LRU

4. For each of the following applications, determine whether you would use TCP or UDP and explain why. (10%)
   A. File transfer
   B. Video streaming
   C. Tele-conference
   D. DNS query
   E. Online game