

國立成功大學

114學年度碩士班招生考試試題

編 號：173

系 所：資訊管理研究所

科 目：計算機概論

日 期：0211

節 次：第 2 節

注 意：1.不可使用計算機
2.請於答案卷(卡)作答，於
試題上作答，不予計分。

Part A.

I. Multiple choice questions. Choose the alternative that best completes the statement or answers the question. **30%**

1. Which of the following scenarios best illustrates the use of a virtual machine (VM) in a business environment?

- A. Hosting a single operating system on a physical server for file storage.
- B. Running legacy software on a modern operating system without modifying the hardware.
- C. Using a high-performance cluster to solve parallel computing problems.
- D. Utilizing a dedicated physical server to increase network bandwidth.

2. In a multitasking operating system, how does the OS ensure that multiple processes execute efficiently without interfering with each other?

- A. By using a single CPU core to execute all processes sequentially.
- B. By dividing available memory equally among all processes.
- C. By implementing process scheduling and memory protection mechanisms.
- D. By prioritizing user applications over system processes to maximize responsiveness.

3. Suppose that items I, J, K, L, and M are inserted into an initially empty queue, in that order. The queue is then dequeued four times, and each item removed is pushed onto an initially empty stack. If two items are then popped from the stack, what is the next item that will be popped from the stack?

- A. item I B. item J C. item K D. item L E. item M

4. A user reports that their system slows down significantly when running multiple applications, and the hard drive activity increases. This behavior is likely due to:

- A. Insufficient CPU cores for multitasking.
- B. Virtual memory swapping due to insufficient RAM.
- C. A failed hard drive partition.
- D. An outdated operating system.

5. A company implements a stateful firewall in its network. How does this type of firewall enhance security?

- A. By encrypting all outgoing traffic to prevent data leaks.
- B. By analyzing and filtering packets based on predefined rules.
- C. By monitoring the state of active connections and allowing packets that are part of established connections.
- D. By scanning incoming packets for malware before allowing them to enter the network.

6. A computer system uses virtual memory with a paging mechanism to manage memory. The virtual address space is divided into pages, and the physical memory is divided into frames of the same size. Which of the following statements about paging and virtual memory is correct?

- A. Paging eliminates the need for swapping data between RAM and disk.
- B. The page table stores the mapping between virtual page numbers and physical frame numbers.
- C. Virtual memory allows the entire program to be loaded into RAM before execution.
- D. A page fault occurs when the operating system allocates a physical frame to a new process.

7. In a multitasking operating system, which of the following statements correctly differentiates foreground and background jobs?

- A. Foreground jobs run without user interaction, while background jobs require constant user input.
- B. Foreground jobs are directly controlled by the user, while background jobs run independently without direct user control.
- C. Only one foreground job can run at a time, but multiple background jobs cannot run simultaneously.
- D. Background jobs always have higher priority than foreground jobs to ensure smooth system operation.

8. In an object-oriented programming system, consider the following scenario:

A base class `Vehicle` defines a method `startEngine()`. Two derived classes, `Car` and `Motorcycle`, override the `startEngine()` method to provide their specific implementations. At runtime, a `Vehicle` reference is used to invoke the `startEngine()` method on an instance of either `Car` or `Motorcycle`.

Which of the following concepts ensures that the correct implementation of `startEngine()` is invoked based on the object type at runtime?

- A. Encapsulation, which hides internal state and restricts direct access to it.
- B. Polymorphism, which allows a single interface to be used for different data types or objects.
- C. Inheritance, which allows the `Car` and `Motorcycle` classes to derive properties and behaviors from the `Vehicle` class.
- D. Abstraction, which defines abstract methods for subclasses to implement.

9. An adjacency matrix is a two-dimensional array commonly used to represent the edges of a graph. It is ideal for certain types of graphs due to its characteristics. In which of the following scenarios would an adjacency matrix be the most efficient choice?

- A. A graph with 150 vertices and 200 edges
- B. A network with 40 nodes and 600 connections
- C. A dataset representing 300 elements with 500 relationships
- D. A diagram with 25 points and 50 connections
- E. An adjacency matrix is never efficient for any graph.

10. A user performs an internet speed test and sees a result of 50 Mbps for their download speed. Which of the following statements correctly interprets this value?

- 1. Mbps stands for megabytes per second, representing data transfer in bytes.
- 2. Mbps stands for megabits per second, representing data transfer in bits.
- 3. To convert Mbps to megabytes per second (MBps), divide the value by 8.
- 4. A speed of 50 Mbps means approximately 6.25 megabytes per second can be downloaded.

Which of the following options is correct?

- A. Statements 1 and 3 are true.
- B. Statements 2 and 3 are true.
- C. Statements 2 and 4 are true.
- D. Statements 1 and 4 are true.
- E. All statements are true.

II. Short-Answer Questions

1. Consider the following recursive function. 5%

```
int Calculate(int n)
{
    if (n <= 2)
        return 1;
    else
        return Calculate(n - 2) + n;
}
```

What is the value returned by the function call `Calculate(7)`?

2. What is the difference between a virtual function and a pure virtual function in C++? Explain their purposes and provide an example to illustrate how each is used. 5%
3. A company is exploring the possibility of optimizing its web services by implementing a lightweight UDP-based HTTP service alongside an existing TCP-based web server on port 80. Is it technically feasible to run both the UDP-based HTTP service and the TCP-based web server on the same port (80) simultaneously? Discuss in detail the technical limitations or conditions under which this might be possible, including how the transport layer handles such cases and its implications for client-server communication. 5%
4. The Intel Core i7-13700K processor is characterized by the following specifications:

Series: Intel i7 series

Cores and Threads: 16 cores and 24 threads

Clock Speed: A base frequency of 3.4 GHz

Analyze the significance of each specification in terms of the CPU's architecture and machine cycles.

Additionally, evaluate how these features contribute to the processor's performance in multitasking, gaming, and professional workloads. 5%

Multiple choice questions (8%)

- B-1. When an enterprise performs data backup, which of the following processes can best ensure the security and integrity of the backup data? (A) Delete the original data immediately after backup to save storage space (B) Regularly store the backup data in an off-site storage space (C) In order to complete the backup quickly, only perform backups when important files have changed (D) Back up all Stored on the same server as the original data
- B-2. A router is a common network hardware device. Which of the following is the most important function of a router? (A) A device that allocates hardware locations (B) A device that specifically determines whether data is sent from one line to another in a local area network (LAN) (C) Responsible for forwarding data packets from one network to another network (D) encrypts all data packets on the network

Discussion Quiz:

- B-3. Under the IPv6 prefix, 2001:b030:10e:10::/60, how many more subnets can be created at most, why? (4%)
Under the IPv4 class B address of 140.116.0.0 in NCKU, how many class C subnets can be assigned at most, why? (4%) These two IP standards (IPv6 and IPv4) are standards for which layer in the 5-layer architecture of TCP/IP? (2%)
- B-4. Describe the definition of superkey, primary key, and foreign key in the database, respectively (6%). If there is a reservation system for a class, please describe the following. Write a SQL command for each of the following 3 questions.

Hotel (hotelNo, hotelName, city)

Room (roomNo, hotelNo, type, price)

Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)

Guest (guestNo, guestName, guestTel)

甲、 Show the price of all rooms in Taipei by increasing 10 percent of the original price. (3%)

乙、 List the guest names who book more than five times in one hotel. (3%)

丙、 List the guest names who used to book all hotels. (4%)

- B-5. 2024 may be defined as the first year of AI PC. Please provide a basic definition (4%) of AI PC, list the capabilities it should have for the three processing units to operate together, and explain the tasks that the three processing units should be responsible for. (6%)
- B-6. At present, artificial intelligence has become the focus of the industry. One of the hot topics is LLM, but SLM has also been raised. Please explain what SLM is (2%). Discuss 2 advantages of SLM compared with LLM from your perspective. (4%)