

一、選擇題（單選）24題，每題2.5分，共60分，請在每題的選項內選擇最適當的答案。

注意：答錯倒扣1分，扣至零分為止。（不答不倒扣）

1. Which of the following is wrong about OSI Model? (A) layer 8 is Application (B) layer 5 is Session (C) layer 4 is Transport (D) layer 2 is Data Link (E) all of the above are correct (choose this one only if none of the above can be chosen).
2. Which of the following is the industry standard protocol for email sending? (A) Simple Mail Transfer Protocol (SMTP) (B) Internet Message Access Protocol (IMAP) (C) Post Office Protocol (D) Post Office Protocol 3 (POP3) (E) none of the above.
3. Which of the following technique is used in data link layer for reliable and sequential delivery of data packets while allowing multiple packets to be sent at a time to improve efficiency? (A) automatic repeat request protocol (B) sliding window protocol (C) request and acknowledgment protocol (D) multicast (E) none of the above.
4. Which of the following is wrong about Dynamic Host Configuration Protocol (DHCP)? (A) it is used on Internet Protocol (IP) networks (B) it uses a client-server architecture (C) it allows the automatic management of IP addresses (D) it offers great benefit to mobile users as valid configuration parameters are automatically obtained from the new network (E) all of the above are correct (choose this one only if none of the above can be chosen).
5. Which of the following is wrong about virtualization technology? (A) network virtualization divides one physical network into separate, independent virtual networks (B) network virtualization can combine multiple physical networks to one virtual, software-based network (C) CPU virtualization allows a single processor to act as if it was multiple individual CPUs (D) CPU virtualization allows one to run multiple different operating systems on one machine (E) all of the above are correct (choose this one only if none of the above can be chosen).
6. Which of the following is wrong about Virtual machines (VMs)? (A) a VM is a compute resource that uses software instead of a physical computer to run programs and deploy apps (B) when more than one VMs run on a physical host machine, each virtual machine runs its own operating system and functions separately from the other VMs (C) benefits of VMs include easy provisioning and maintainability, and high availability (D) a software called hypervisor sits between the VMs and the host and is responsible for allocating the computing resources of the host to VMs (E) all of the above are correct (choose this one only if none of the above can be chosen).
7. _____ is a unique identifier assigned to a network interface controller for use as a network address in communications within a network segment. It is used in most IEEE 802 networking technologies, including Ethernet, Wi-Fi, and Bluetooth, (A) globally unique identifier (B) IP address (C) media access control address (D) transmission control address (E) none of the above.
8. Which of the following is wrong about packet switching? (A) packet switching transmits data across digital networks by breaking it down into blocks (B) in datagram packet switching, each packet has a header that includes the origin IP address, the destination IP address, the number of packets in the entire data file, and the sequence number (C) in datagram packet switching, the packets of a file go through the same route (D) in a virtual circuit, the connection appears to be a dedicated physical circuit (E) all of the above are correct (choose this one only if none of the above can be chosen).
9. _____ is a network multiple access method in which carrier sensing is used, but nodes attempt to avoid collisions by beginning transmission only after the channel is sensed to be "idle"

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- (A) carrier-sense multiple access with collision avoidance (CSMA/CA) (B) carrier-sense multiple access with collision detection (CSMA/CD) (C) carrier-sense multiple access with collision reduction (CSMA/CR) (D) carrier-sense multiple access with channel idling (CSMA/CI) (E) none of the above.
10. Which of the following is wrong about information security? (A) in the CIA triad, C stands for Confidentiality (B) in the CIA triad, I stands for Integrity (C) in the CIA triad, A stands for Accessibility (D) Confidentiality means that only authorized individuals/systems can view sensitive or classified information (E) all of the above are correct (choose this one only if none of the above can be chosen).
11. In information security, _____ refers to the type of attacks when a communication between two systems or people is intercepted by an unauthorized party. The person intercepting attempts to either eavesdrop on the exchange or impersonate one of the authorized parties. (A) third-party attack (B) DNS Tunneling (C) Phishing (D) Zero-day exploit (E) none of the above.
12. Which of the following is wrong? (A) RSA algorithm is an asymmetric cryptography algorithm (B) RSA is based on the fact that it is difficult to factorize a large integer (C) in a public-key cryptosystem, the encryption key is private (D) RSA is not meant to be used to directly encrypt user data. (E) all of the above are correct (choose this one only if none of the above can be chosen).
13. Which of the following is wrong in the context of transaction processing? (A) A in the acronym ACID refers to atomicity (B) C in the acronym ACID refers to consistency (C) I in the acronym ACID refers to integrity (D) D in the acronym ACID refers to durability (E) all of the above are correct (choose this one only if none of the above can be chosen).
14. Which of the following is wrong about database normalization? (A) to satisfy 1st normal form, each column of a table must have a single value (B) in 2nd normal form, all non-key attributes are fully functional dependent on the primary key (C) 3rd normal form is used to reduce the data duplication (D) 3rd normal form does not allow transitive dependency for non-prime attributes (E) all of the above are correct (choose this one only if none of the above can be chosen).
15. _____ refers to the mechanism used in DBMS to allow removal of all the previous transaction logs from the system and permanently stored them in the storage disk (A) backlogging (B) checkpoint (C) serialization (D) two-phase commit (E) none of the above.
16. Which of the following is wrong? (A) a process is an execution of a specific program (B) a process can have multiple threads (C) compared to threads, processes are more lightweight (D) in terms of memory sharing, processes are isolated (E) all of the above are correct (choose this one only if none of the above can be chosen).
17. In operating system, _____ refers to the situation in which two or more processes continually repeat the same interaction in response to changes in the other processes without doing any useful work? (A) deadlock (B) livelock (C) starvation (D) busy waiting (E) none of the above.
18. Which of the following is a typical objective for CPU scheduling in operating systems? (A) max CPU utilization (B) max throughput (C) min waiting time (D) fair allocation of CPU (E) all of the above are typical objectives.
19. Which of the following CPU scheduling algorithm is starvation-free? (A) Shortest-Job-First (B) Priority Scheduling (C) Round Robin (D) all of the above (E) none of the above.
20. In operating systems, _____ refers to the technique for mediating between a computer application and a slow peripheral, such as a printer, that allows programs to "hand off" work to be done by the peripheral and then proceed to other tasks. (A) buffering (B) spooling (C) preemptive scheduling (D) non-preemptive scheduling (E) heap.
21. Which of the following is wrong about ER model? (A) it is a high-level data model (B)

an entity may be any object, class, person or place (C) attribute is used to describe the property of an entity (D) diamond shape is used to represent attribute (E) all of the above are correct (choose this one only if none of the above can be chosen).

22. _____ refers to the part of an operating system that loads and links the shared libraries needed by an executable when it is executed at run time, by copying the content of libraries from persistent storage to RAM, filling jump tables and relocating pointers. (A) code generation (B) code loader (C) assembler (D) dynamic linker (E) none of the above.
23. Which of the following is wrong about “metaverse”? (A) it envisions a future of social connection in a 2D virtual world (B) VR is a key technology in metaverse (C) Facebook changed its name to “meta” to usher in the metaverse (D) blockchain is a key technology in metaverse to offer digital proof of ownership for assets in the metaverse (E) all of the above are correct (choose this one only if none of the above can be chosen).
24. Which of the following is wrong about non-fungible token (NFT)? (A) NFTs can be associated with digital files such as photos, videos, and audio to show ownerships (B) NFT is a unique and non-interchangeable unit of data stored on a blockchain (C) two copies of a digital file can be associated with two different NFTs (D) assets in the metaverse case be traded as NFTs (E) all of the above are correct (choose this one only if none of the above can be chosen).

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※ 注意：請於試卷內之「非選擇題作答區」標明題號依序作答。

The following C++ code fragment shows the class definition of an ADT hash table that stores student information. In this implementation, the **chaining** approach is adopted to resolve collisions.

```
class ChainStudentNode
{
private:
    int studentID; // the ID (key) of a student
    string name; // the name of a student
    string dept; // the department name of a student
    ChainStudentNode *next;

    friend class StudentHashTable;
}; // end ChainStudentNode

class StudentHashTable
{
public:
    ...
    void insertStudent(int sID, string sName, string sDept);
    string retrieveName(int sID);
protected:
    int hashIndex(int sID);
    // hash function; return the location of a student ID
    ...
private:
    static const int HASH_TABLE_SIZE = 101;
    ChainStudentNode *table[HASH_TABLE_SIZE]; // Hash table
};
```

- (a) (15 points) Write the `insertStudent()` function that inserts a student's record into the hash table. Here, we assume the inserted student is never duplicated.
- (b) (15 points) Write the `retrieveName()` function that returns the name of a student given the student's ID. Note that the function returns an empty string if no stored student matches the given ID.
- (c) (10 points) Write the `hashIndex()` function that generates the location (table index) by taking the modulo of the last three `studentID` digits. For example, the location of student ID 11725935 is $935\%101 = 26$.

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