

考試科目	計算機概論	系所別	資訊管理學系/科技組	考試時間	2 月 12 日(三) 第 2 節
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Short-Answer Questions (100 points)

- Answer the following questions about linear models. (10 pts in total)
 - Briefly explain linear regression and logistic regression. Highlight their major differences. (5 pts)
 - Consider the following steps to learn a binary classifier. First, label the two classes as 0 and 1. Second, learn a linear regression $y = f(\bar{x})$ using usual supervised learning. Third, decide a threshold t such that $f(\bar{x}) \geq t$ gives classification outcome 1, and $f(\bar{x}) < t$ gives classification outcome 0. Does this method make sense? Please detail your reasons. (5 pts)
- In a software company, several teams simultaneously work on separate features in the same codebase, which is maintained using Git and GitHub. (15 pts in total)
 - What is a Git workflow, and what is a GitHub workflow? Highlight their major differences. (5 pts)
 - Suppose two teams create their own feature branch from the main branch. When they attempt to merge their changes back into the main branch, the merge fails due to conflicts in the code. Explain the steps required to identify and resolve the merge conflicts. (5 pts)
 - Explain how to create a pull request to commit new changes to the main branch. Your explanation should start with forking the repository and end with successfully merging the pull request. (5 pts)
- A network packet has different headers. Please answer the following questions regarding the IP header corresponding to the Internet Protocol (IP). (15 pts in total)
 - During packet transmission, which type of network device typically examines the IP address in the IP header to decide the packet's destination? (2 pts)
 - Which layer of the OSI model does the action mentioned above correspond to? (2 pts)
 - The IP header contains a TTL (Time to Live) field. Please explain its functionality. (2 pts)
 - Do packets transmitted over a network always have an IP header? Why or why not? (3 pts)
 - Suppose Host A wants to send a packet to Host B. Given their IP addresses, how do we determine whether A and B belong to the same subnetwork? (3 pts)
 - IP addresses are divided into private IPs and public IPs. Please explain their definitions and use cases. Can a host with a public IP send a packet to a host with a private IP address? Why or why not? (3 pts)
- Briefly describe how Dijkstra's shortest path algorithm works. Explain why it cannot handle graphs that contain negative edges. (15 pts)
- Explain the meaning and purpose of hashing, encoding, and encryption. Highlight their differences and how they contribute to data processing and security. (15 pts)
- In the following function, a, b, n are nonnegative integers. Explain what $f(a, b, n)$ computes. (5 pts)

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```
function f(a, b, n) {
    if (n==0)
        return a;
    if (n%2==0)
        return f(a, b*b, n/2);
    else
        return f(a*b, b, n-1);
}
```

7. Consider the following processes. Please draw the schedules (Gantt Chart) and calculate the average waiting time for the Preemptive Shortest Job First, and Round Robin (time-quantum = 4 ms) scheduling policies, respectively. (10 pts)

Process	Arrival Time	CPU Burst Time
P1	0 ms	15 ms
P2	3 ms	7 ms
P3	5 ms	2 ms
P4	7 ms	3 ms

8. Suppose that we have a class Agent with the following interface. (15 pts)

```
class Agent {
    Position getPosition();           // get the current position of the agent
    bool foundFlag();                 // check if the agent found a flag at the current position
    bool moveLeft();                  // move one step leftward from the current position
    bool moveRight();                 // move one step rightward from the current position
    bool moveUp();                    // move one step upward from the current position
    bool moveDown();                  // move one step downward from the current position
}
```

Note that a move is successful only when the invocation returns true. (For example, suppose you call moveLeft. If it returns false, then the agent stays still after the invocation. Otherwise, it moves one step leftward.) Please implement a function findFlag that leads an agent to find a flag. The function should either return the flag's position or return null when no flag is reachable from the agent's starting position.

```
Position findFlag(Agent a) { ... }
```

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。
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