一、網路流量一時過大會造成封包延遲或封包丟失等問題，面對此情況，網路管理者通常有下列三種策略：(1)Overprovisioning, (2)Priority，(3) Quality of Service Guarantees，請詳細說明此三種策略的意義及各自的優缺點。（15 分）

二、IPsec (Internet Protocol Security)協定組是實現 VPN(Virtual Private Network)的重要技術，請回答下列問題：

1. IPsec 中的 AH(Authentication Header)協定和 ESP(Encapsulating Security Payload)協定的作用有何不同？(5 分)

2. IPsec 中的 Transport mode 和 Tunnel mode 兩種操作方式及優缺點為何？(5 分)

三、在資料庫寫入或更新的過程中，為確保交易(transaction)可以正確執行，須確保滿足 ACID (Atomicity, Consistency, Isolation, Durability) property。請詳細說明此四個特性。(8%)

四、請詳細說明 homogeneous distributed database 與 heterogeneous distributed database 兩者之差異。(10%)

五、何謂 NoSQL 資料庫？請詳細說明 NoSQL 資料庫所具有之特性。(7%)

六、(10%) To use Peterson's solution to solve the critical-section problem between two processes Pi and Pj, please fill the blank (a), (b), (c), (d) and (e) in structure of Pi in Program 1.

```
do {
        flag[i] =  (a) ;
        turn =  (b) ;
        while ( (c) &&  (d) );
            critical section
        flag[i] =  (e) ;
            remainder section
} while (true);
```

Program 1

七、(5%) Please describe two strategies commonly being used in OS to allocate the kernel memory for structures of varying sizes.

八、(5%) Given a computer memory system with the page size 16KB, if the system guarantees that the TLB (Translation Look-ahead Buffer) reach is at least 32MB, how many TLB entries should this system have?

九、(5%) Suppose we a function $P(x) = a + bx^5 + cx^{10} + dx^{15}$. Given a x value, when deriving $P(x)$ value, what is the minimum number of "add" operation? what is the minimum number of "multiply" operation?

注意:背面有試題

十、 What is runtime polymorphism or dynamic method dispatch in Java? (5 points), Provide example Java codes to explain this concept (5 points)

十一、

The following programming method was written to determine whether its String parameter reads identically left-to-right and right-to-left (the so called palindrome 回文).

```java
boolean isAPalindrome(String s) {
    int i = 0, j = s.length() - 1;
    while (i != j && s.charAt(i) == s.charAt(j)) {
        i++;
        j--;
    }
    return (i == j);
}
```

This method compiles fine; however, it contains a logic error, which may result in a run-time error, or wrong output.

1. Find the error and explain what problem it will cause (5 points)

2. Fix the error (write the correct statements) (5 points)

3. Write an alternative, recursive implementation (5 points)