注意事項：

1.本科目考試時間共 90 分鐘。

2.答案卷書寫題號依序作答，不必抄題。

3.試卷不可書寫任何辨別個人姓名或特殊標記，違反者以零分計算。

4.請於試題簽名並填寫准考證號碼，繳卷時「試題」、「答案卷」一併繳回。

(10% for each of the following 10 problems)

1. Consider number conversion and digital logic.

   a) Convert the decimal number 62.3125 to its binary equivalent.

   b) Simplify the Boolean function F(x,y,z)=xy+x'z+yz to a minimum number of literals.

2. Consider the parameter-passing methods in C programming language.

   a)Write a C program that prints the larger of two integer numbers entered from the keyboard. The program must include a function to do the actual comparison of two numbers. (Hint: call by value)

   b)Write a C program that will swap two integer variables. The variables must be typed in by the user, printed out, swapped, then printed out again. Also, the program must include a function to do the actual swapping. (Hint: call by address)

3. Consider object-oriented languages. Please explain the meaning of the following terms:

   a) Overriding

   b) Overloading

   c) Abstract class

4. Find the network address and the hostid for the following:

   IP Address: 200.34.22.156

   Mask: 255.255.255.240

5. The IP header can be from 20 to 60 bytes and contains the following fields:

   VER(4bits), HLEN(4bits), Service type(8bits), Total length(16 bits), Identification(16 bits) Flags(3 bits), Fragmentation offset(13 bits), Time to live(8 bits), Protocol(8bits), Header checksum(16bits), Source IP address(32bits), Destination IP address(32bits), Option.

   Which fields of the IP header change from router to router? Why?

6. Considering a database system, please describe the two-phase locking protocol. What problems can be avoided by using this protocol?

7. In a database system, please describe two features that can be provided by using view.

8. Suppose a processor uses a prioritized round robin scheduling policy. New processes are assigned an initial quantum of length q. When a process uses its entire quantum without blocking, its new quantum is set to twice its current quantum. If a process blocks before its quantum expires, its new quantum is reset to q. For the purposes of this question, assume that every process requires a finite total amount of CPU time.

   (1) Suppose the scheduler gives higher priority to processes that have larger quanta. Is starvation possible in this system? Why or why not?

   (2) Suppose instead that the scheduler gives higher priority to processes that have smaller quanta. Is starvation possible in this system? Why or why not?

9. Please give an algorithm to determine whether a graph is connected or not?

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10. Huffman coding tree is used to construct minimal length encodings for messages when the frequency of letters used in the messages is known. Suppose we have the frequency of occurrence for six letters in a message are as given below:

Letter	E	Q	M	L	S	T
Frequency	29	5	7	12	4	8

(1) Please build the Huffman coding tree,
(2) Please encode the word SET by using the Huffman coding tree.

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2. IPsec supports secure exchange of <u>packets</u> at the <u>IP</u> layer. Please describe the protocols in IPsec and illustrate the function for each protocol.

3. (1) Please describe the feature of a heap,
   (2) What are the minimal and maximal numbers of elements in a heap with height m?

4. Under UNIX, the fork() primitive creates two identical processes. Yet, those processes can yield very different results. Explain and give a simple example.

2. What is the output of the following program:

```
#include <stdio.h>
int main(){
    int arr[]={30,25,20,15,50},*p;
    p=arr;
    *(arr+3)=18+*(p++);
    printf("%d,%d\n",arr[3],*(p+3));
}
```

6. Give a brief definition of each of the following:
   a) RISC, CISC
   b) ICMP, IGMP
   c) GSM, GPRS

8. During the execution of a process, the process will be changed its statuses under various situations. For each of the following situation, please give the before and after statuses of the process respectively:
   (1) the process issues a system call,
   (2) the process forks a child process,
   (3) the I/O request of the process is complete.

9. Consider the technologies for generation of dynamic web content.
   a) What are the main differences between ASP and ASP.NET?
   b) What are the main differences between CGI and Servlet?