※ 注意：請於試卷內之「非選擇題作答區」依序作答，並應註明作答之大題及小題題號。

請照題號次序作答
Use C, C++ or Java programming language to design your computer programs.

1. (10%) Number conversions.
   a. (3%) Transform $-387_{(10)}$ to 32-bit signed number, using two's complement.
   b. (3%) Transform 223.2 to 32-bit IEEE format, that is, IEEE single precision floating-point number.
   c. (4%) The x69DD0000 and xE8F00000 are the bit patterns of two numbers that are in IEEE 754 single precision floating-point format. Please calculate the results of x69DD0000 + xE8F00000. Present your result in hexadecimal value of the IEEE single precision floating-point format.

2. Choose Options (10%)

Descriptions	Options
The _(1)_ layer is responsible for moving the individual bits that make up the frame to the next node.	(a) Application
The _(2)_ layer is responsible for the delivery of individual packets from the source host to the destination host.	(b) Transport
The _(3)_ layer is responsible for the logical delivery of a message between client and server processes.	(c) Network
The _(4)_ layer is responsible for node-to-node delivery of frames.	(d) Data link
The _(5)_ layer enables the user to access the network	(e) Physical
The _(6)_ layer has a specific duty: **routing**.	
The _(7)_ layer carries out congestion control and flow control.	
Multiplexing and de-multiplexing is the duty of _(8)_ layer	
SCTP defined at the _(9)_ layer	
SMTP are protocol of _(10)_ layer	

3. (10%)
   a. (3%) A computer uses **isolated I/O** addressing. Memory has 2^8 words. If each controller has 8 register, how many controller can be accessed by this computer?
   b. (3%) A computer uses **memory-mapped I/O** addressing. The address bus uses 11 lines (11bits). If memory is made of 2000 words, how many four-register controllers can be accessed by this computer?
   c. (2%) Which device has **circle** track, which has **spiral** track? Hard disk or CD-ROM.
   d. (2%) What is the **machine cycle**? Describe the operation of each steps.

4. (10%) Explain the differences between the two terminologies.
   a. Programmed I/O vs. Interrupt-driven I/O
   b. Repeater vs. Bridge
   c. RISC vs. CISC
   d. Batch system vs. Time-sharing system
   e. Assembler vs. Complier

5. (10%)
   a. (5%) What following options are features of RISC architecture, and what are features of CISC architecture? (a) register to register operation (b) optimize instructions/program (c) small code sizes (d) single-clock, reduced instruction
   b. (5%) In order to improve the throughput of computer, modern computers use a technique called pipeline. What is pipeline? Which term of the following equation can be improved by pipeline, (a) or (b) or (c)? Explain your answer.

$$\underbrace{\frac{time}{program}}_{} = \underbrace{\frac{time}{cycle}}_{(a)} \times \underbrace{\frac{cycles}{instruction}}_{(b)} \times \underbrace{\frac{instructions}{program}}_{(c)}$$

見背面

6. (10%) The "Quoted-printable encoding" is defined as following:
    Any 8-bit byte value may be encoded with 3 characters, an "=" followed by two hexadecimal digits (0–9 or A–F) representing the byte's numeric value. For example, a US-ASCII form feed character (decimal value 12) can be represented by "=0C", and a US-ASCII equal sign (decimal value 61) is represented by "=3D". All characters except printable ASCII characters or end of line characters must be encoded in this fashion.
    Please write a function or a method that can convert a general string into "Quoted-printable encoding" string.

7. (10%) Read the following class definition:

```
1.  public class E1 extends Exception {
2.  }
3.  Public class E2 extends E1 {
4.  }
5.  Public class E3 extends Exception {
6.  }
7.  public class A {
8.      public void m1() throws E1 {}
9.  }
10. public class B extends A{
11.     protected void m1() throws E2, E3 {}
12. }
13. public class Test {
14.     public static void main(String[] args) {
15.         try {
16.             A ref = new B();
17.             ref.m1();
18.         } catch (E3 e) {
19.             e.printStackTrace();
20.         }
21.     }
22. }
```

    Will these codes be compiled without error? If any error occurred, describe your answer to correct the codes without change the definitions of class E1, E2, E3, A.

8. (20%) The combination function is defined as the following:
    $$C(n,k)=\begin{cases}1 & \text{, if } k=0 \text{ or } n=k \\ C(n-1,k)+C(n-1,k-1) & \text{, if } n>k>0\end{cases}$$
    a. (10%) Please write a program in **recursive** way to implement the function.
    b. (10%) Please write an **iterative** program using a two-dimension array to implement the function.

9. (10%) A DNA sequence or genetic sequence is a succession of letters representing the primary structure of a real or hypothetical DNA molecule or strand, with the capacity to carry information as described by the central dogma of molecular biology. The possible letters are A, C, G, and T, representing the four nucleotide bases of a DNA strand — adenine, cytosine, guanine, thymine — covalently linked to a phosphodiester backbone.
    Please write a program to report how GC-rich some sequence is. (In other words, just give the percentage of G and C in the DNA.)

試題隨卷繳回