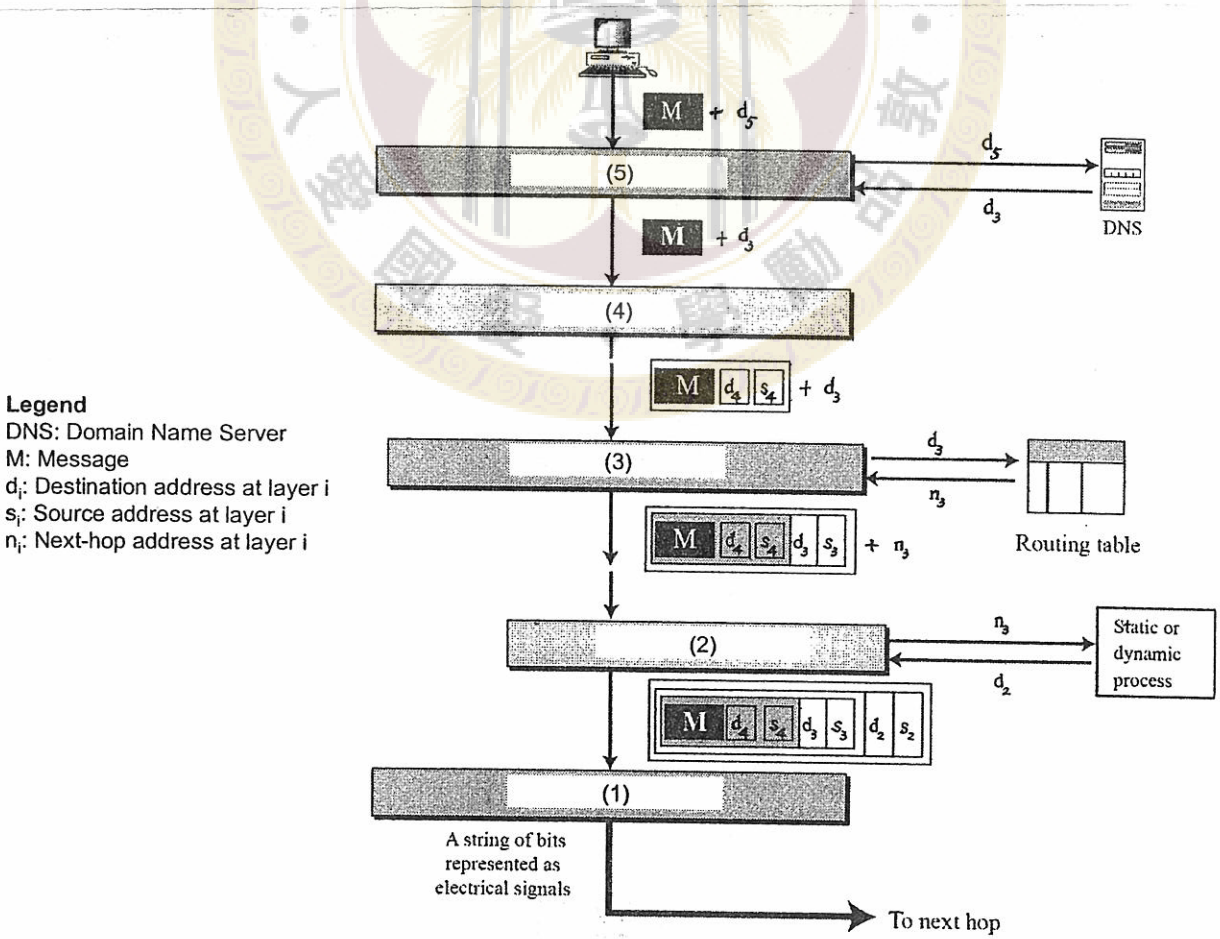
請照題號次序作答

Use C, C++ or Java programming language to design your computer programs.

1. (10%) Number conversions.
   a. (3%) Transform **-123** $_{(10)}$ to 32-bit signed number, using **two's complement**.
   b. (3%) Transform **345.67** to 32-bit IEEE format, that is, IEEE single precision floating-point number.
   c. (4%) The **xD5700000** and **xD59D0000** are the bit patterns of two numbers that are in IEEE 754 single precision floating-point format. Please calculate the results of xD5700000 – xD59D0000. Present your result in hexadecimal value of the IEEE single precision floating-point format.

2. (10%) Two computers are only different in cache systems.
   Computer A: one-level cache. Cache hit time: 2 clocks, hit rate: 0.90, miss penalty: 20.0 clocks
   Computer B: two-level cache. L1 hit time: 1 clocks, L1 hit rate: 0.70, L2 hit time: 6.0 clocks, L2 hit rate: 0.95, L2 miss penalty: 20.0 clocks. Which computer has better cache system? Give your reasons.

3. (20%) The following diagram depicted the protocol suite used by **Internet**. Please answer the following question.
   a. (10%) What are the names of the layer (1), (2), (3), (4), (5)?
   b. (4%) What is the name of the address in layer (2)? What is the length of this address?
   c. (4%) What is the name of the address in layer (3)? What is the length of this address?
   d. (2%) What is the name of the address in layer (4)?



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4. (20%) Terminology explanation:
   a. (6%) Explain the features of **encapsulation**, **inheritance** and **polymorphism** in object-oriented programing.
   b. (6%) Explain the **machine cycle** and its three phases.
   c. (4%) Compare the **demand paging** and **demand segmentation** in virtual memory system.
   d. (4%) Explain the **context switch** in multi-processing

5. (20%) Read an *n*-by-*n* square matrix **A** from standard input ($n < 256$). Write a program to calculate and print the result of $\mathbf{A}^k$. The $\mathbf{A}^k$ is defined as: $\mathbf{A}^k = \prod_{i=1}^{k} \mathbf{A}$.

   To compute $\mathbf{A}^5$, which $\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$.

   Wen can input the following lines to the program:
   ```
   3
   1 2 3
   4 5 6
   7 8 9
   5
   ```
   (The number of first line indicates the number of rows/cols of this square matrix. The following lines list all the elements of this matrix. The number of last line indicates the *k* of $\mathbf{A}^k$.)

6. (20%) A **palindromic prime** (sometimes called a **palprime**) is a prime number that is also a palindromic number (A palindromic number or numeral palindrome is a 'symmetrical' number like 16461). The first few decimal palindromic primes are:
   2, 3, 5, 7, 11, 101, 131, 151, 181, 191, 313, 353, 373, 383, 727, 757, 787, 797, 919, 929,....
   Please write a program which can list all the **palindromic primes** between 1 and 1000.

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