1. (10%) 選擇題：每小題各兩分
   
   (1) A user prefers _____, if he uses the same computer for reading the mail
       
   a) SMTP  b) POP3  c) IMAP  d) MIME

   (2) The ________ command allows a client to check whether a server is up and running
       
   a) Finger  b) Ping  c) Tracert  d) Hop

   (3) ______ acts as a pointer to another web page
       
   a) Hyperlink  b) Web page  c) Mouse click  d) Images

   (4) Which of the following is associated with web security?
       
   a) Authentication  b) Authorization  c) Privacy  d) All the above

   (5) Which one of the following is the most popular non-XHTML format files on the web
       
   a) Text  b) Binary  c) Pdf  d) Word

2. (3%)
   (a) (True or False) Job seekers can both reply to ads and post their information on several online recruiting sites.

   (b) If you are looking for a job, which web site in Taiwan you will try to send your resume?
       Give a name of the web site.

3. (a) (5%) Please give two famous web sites which apply "Social Network" for Electronic Commerce.

   (b) (5%) Why is this kind of business model working? Explain it.

4. (a) (5%) Do you know the answer of "Person of year 2006" from Time Magazine?

   (b) (5%) Explain the reason why the Person is chosen by Time Magazine to be "Person of year 2006".
5. (10%) Which of the OSI layers is (are) involved in each of the following activities:
   a. sending a frame to the next station
   b. sending a packet from source to the destination
   c. sending a long message from source to the destination
   d. logging into a remote computer
   e. encrypting and decrypting data

6. (5%) What is CIDR (Classless Internet Domain Routing)?

7. (4%) The declarations of the functions are listed as follows:
   (a) f(int, int);
   (b) f(double, int);
   (c) f(double, double, double);
   Show that which functions will be called by the following function calls?
   (1) f(2,3)  (2) f(2.3,1)  (3) f(2.3,2,3)  (4) f(1.1,2.2,3.3)

8. (5%) Describe the "lower bound time complexity of a problem". Is it possible that the lower bound of a problem is $\Omega(n \log n)$ and that an algorithm solving this problem runs in time complexity $O(n)$?

9. (9%) Construct a minimum cost spanning tree for the following graph by the Kruskal's algorithm.
10. 
(a) (6%) Why do we want to reduce redundant information in relation tuples of Web-based database systems? Please explain three reasons.
(b) (8%) Discuss two approaches or formal concepts to reduce redundant information.

11. Virtual stores are selling various products on the Internet. Suppose that virtual stores have been simplified and organized as a binary tree structure. The number of virtual stores is \( n \). Each node represents one virtual store. A root node \( H \) denotes the headquarters of all virtual stores. Assume that the headquarters is responsible for inventing new products. Once a new product is created, the headquarters initiates a new product cycle by creating new product information and transmitting the new product information to all other virtual stores as the following. Virtual stores receive the new product information from their parents, process (record) the product information, and transmit the product information to their children. Once all virtual stores have recorded the new product information, the new product cycle is completed.

Assume that the cost of creating new product information by the headquarters is denoted as \( CC \); the cost of processing product information by a virtual store is denoted as \( PC \); and the cost of transmitting the product information to a child by a virtual store is denoted as \( TC \).

Assume that the time of creating new product information by the headquarters is denoted as \( CT \); the time of processing product information by a virtual store is denoted as \( PT \); and the time of transmitting the product information to a child by a virtual store is denoted as \( TT \).

(a) (5%) What’s the total cost of creating, processing, and transmitting new product information by all virtual stores once a new product is created?
(b) (4%) What’s the best case time required to complete a new product cycle?

What’s the worst case time required to complete a new product cycle?

12. A community of practice (COP) is often formed to provide knowledge sharing among users with similar interests in Web 2.0 applications. Assume that an undirected graph \( G \) is used to record users and their relationships as the following: (i) Each user is represented as a vertex in \( G \); (ii) if user \( i \) and user \( j \) are directly related, then an edge \((i, j)\) connects vertex \( i \) and \( j \); edges have weights assigned to them; (iii) a relation function \( R(i, j) \), \( R(i, j) > 0 \), is used to represent the weight (degree of association) between users \( i \) and \( j \); \( R(i, j) = -\infty \), if users \( i \) and \( j \) are not directly related.

A similarity function \( S(i, j, m) \) is defined to represent the similarity measure between users \( i \) and \( j \) that is computed by considering all the paths with length (number of edges) \( \leq m \) from \( i \) to \( j \).

\[
S(i, j, m) = \max \{ S(i, j, m-1), \max_k \{ S(i, k, m-1) + (R(k, j) / m) \} \}, \text{ for } m > 1;
\]
\[
S(i, j, 1) = R(i, j).
\]

Given a user \( X \), and a pre-specified \( m \) and similarity threshold \( \theta \),
A COP of \( X = \{ Y | \text{ such that } S(X, Y, m) > \theta \} \)

(a) (9%) Write an algorithm to find the COP of a given user \( X \).
(b) (2%) Analyze the time complexity of your algorithm.