1. (a) (5%) The network 172.12.0.0 needs to be divided into subnets where each subnet has the capacity of 458 IP addresses. What would be the correct subnet mask to accomplish this division keeping the number of subnets at the maximum?
(b) (5%) At which OSI layer does data translation and code formatting occur?

2. (a) (5%) Users on network 192.168.69.0/28 are complaining that they cannot access the corporate intranet server at www.inhouse.com. In troubleshooting this problem, you find that you are able to telnet to a workstation on this network to the internal web server via its IP address. What is the likely cause of this problem?
   (1) TCP/IP failure (2) DNS failure (3) FTP failure (4) SNMP failure.
(b) (5%) During encapsulation in which order is information packaged in OSI model?
   (1) Data, Packet, Segment, Frame.
   (2) Segment, Data, Packet, Frame.
   (3) Data, Segment, Packet, Frame.
   (4) Packet, Data, Segment, frame.

3. (5%) What is the difference between multimedia and the hypermedia?

4. (8%) Many Internet companies have pursued Get Big Fast (GBF) strategies. Please give the reasons. Are they successful? Please give the examples.

5. (8%) 試述在 JAVA 的 JFrame 中放置 AWT 元件有什麼缺點？

6. (9%) 請解釋 JAVA 的 MVC(Model, View, Control)

7. (16%) 請利用 ASP language 的 Application 和 Session 物件寫一個簡單的 "線上人數統計程式"

8. (5%) Assume there are N web-sites providing the information you are looking for, and there is no search engine helping you. You need to search the web-sites one by one until you locate the information that suits your needs, i.e., your search is stopped once you find the required information at a web-site, or you have examined all the web-sites. Analyze and derive the average number of web-sites you need to visit for a successful search.
9. Consider the following set of simplified requirements for a Web-info database that is used to keep track of Web sites and Web pages on the Internet.

(i) Each Web site has a unique name and a particular worker who manages the Web-site. Each Web site sets a particular Web page as its Home page. A Web page can be a home page of at most one Web site.

(ii) Each Web-page is described by a title and an unique URL. A Web page may link to several other Web pages, and may be linked by several other Web pages. Each Web-page is maintained by a particular worker.

(iii) The database stores each worker’s name, unique identifier and e-mail address. A worker may manage several Web-sites, and may maintain several Web-pages.

(a) (8%) Draw an ER (Entity-Relationship) schema diagram for this application. You need to clearly indicate the cardinality ratio (1:1, 1:N, or M:N) and participation constraints (total or partial) of each relationship. (State clearly any additional assumptions you make)

(b) (6%) Map the ER schema into the corresponding relational database schema diagram. Specify all the primary keys and foreign keys.

10. The Web pages in a Web site have been simplified and organized in a ternary (degree-three) tree structure.

(i) The root node represents the home page. Each internal node represents a Web page with at most three reference links to other Web pages. All Web pages, except the home page, are referenced by only one Web page. The leaf node represents a Web page that does not have any reference links to other Web pages. A tree structure may be skewed.

(ii) A reference path is defined as a list of Web pages traversed from the Home page (root node) to a leaf node according to the reference links. The length of a reference path is the number of Web pages contained in the reference path. A maximal reference path is a reference path that contains the maximal number of Web pages.

(a) (5%) Assume that the length of a maximal reference path in a Web site (organized as a ternary tree structure) is H. What is the maximal number of reference paths that the Web site may have?

(b) (7%) Write a recursive algorithm to find the length of the maximal reference path in the Web site.

(c) (3 %) Analyze the time complexity of your algorithm.