Answer all four questions. Each question carries 25 marks.

1. a. From the vendor and consumer point of view, what are the major advantages of promoting open client/server platform? (4 marks)

b. What do you understand by the term Internetworking. With the aid of a simple diagram, if necessary, explain very briefly (less than 25 words), how does Internet provide this functionality? (4 marks)

c. With reference to the network diagram shown below, explain in point form, how ARP is used in an Internet environment for station A to communicate to station B. (4 marks)

![Network Diagram]

2. a. Name the two models of network operating system. List in point form, the advantages and disadvantages of each of the models. (8 marks)

e. An important objective of Network Operating System (NOS) is to provide various levels of operating transparencies. Name and explain briefly, four of such transparencies. (5 marks)

2. a. Active documents extend the dynamism by embedding processing login within the document itself. Name the two approaches to achieve active document delivery. Giving your answer in point form, compare and contrast these two approaches. (4 marks)

b. An important improvement of HTTP version 1.0 over HTTP version 0.9 is the support of binary data contents delivery. Explain briefly how this is achieved in terms of the HTTP header extensions (i.e. name the three HTTP header extensions). Suggest any suitable scheme to encode the following binary data 1110010101001111 and show the corresponding HTTP reply header, assuming the binary data is a GIF image file. (5 marks)

c. The HTTP protocol is inherently stateless, which is not appropriate for many applications. State the 3 approaches to solve this problem (need no explanation). (3 marks)

d. Explain the main difference between the HEAD and GET command. (2 marks)

e. Consider the following HTML form. Construct the HTTP request headers (only the most important ones) and body entity when the form is submitted. (5 marks)
f. Give three differences between the POST method and the GET method as used in invoking CGI programs.  

(6 marks)

3. 

a. Consider the following Form-to-Email Perl program that processes form data collected using POST method of delivery. The data is processed and a copy of the data is emailed to the administrator. Answer the following questions pertaining to the program:

The lines with ‘???’ symbol indicates that the statement is incomplete. Each of these lines is identified with the “<<” symbol followed by an alphabet. Write down the identification alphabet in your answer and complete the Perl statement. For example, the answer for <<A should be written as A: #xxxx, where xxxx is the correct answer.  

(15 marks)

```
#???
print "???

"; <<A
read(STDIN, $buffer, ???
);
$pairs = split(/??/, $buffer); <<C
foreach $pair (???
) {
    ($name, $value) = split(/=/, $pair); $value =~ tr/+/ /; $value =~ s/%([a-fA-F0-9][a-fA-F0-9])/pack("C",
        hex($1))/eg; $FORM{$name} = $value;
}
$mailprog = '/usr/lib/sendmail'; # change this to your own email address $recipient = 'nullbox@hotmail.com'; # this opens an output stream and pipes it directly to the sendmail # program. If sendmail can't be found, abort nicely by calling the # dienice subroutine (see below) open (MAIL, "|$mailprog -t") or &dienice("Can't access $mailprog\n");
# here we're printing out the header info for the mail message. You must # specify who it's to, or it won't be delivered:
print MAIL "To: $recipient
"; # now print something to the HTML page, usually thanking the person # for filling out the form, and giving them a link back to your homepage print <<EndHTML;
<h2>Thank you</h2>
Thank you for writing. Your mail has been delivered.<p>Return to our <a href="index.html">home page</a>.<p>
</body>???
```

b. What are some of the design issues that you should be aware if the web application uses cookies approach for state retention (give your answer in point form)? Show how you would construct a HTTP response header to set two cookies for the following name/value pairs, which allows the entire domain site to receive it: userid="allan" and password="year2000".  

(6 marks)

c. With the aid of a simple diagram, briefly describe the DBI architecture.  

(4 marks)
4. Given the following XML document:

```xml
<?xml version="1.0" encoding="utf-8"?>
<book_collection xmlns:html="uri:html">
  <book>
    <isbn>0-2125-0504-1</isbn>
    <author>Patrick Lai</author>
    <title>Internet Computing</title>
  </book>
</book_collection>
```

a. Write an external DTD for the above XML document. Note that each book_collection must have at least one book and each book must have at least one author. (9 marks)

b. Write an XSL stylesheet to convert the above XML document into an HTML document. A sample of the output to a browser is shown. Note that you do not need to get the HTML tags to be perfectly correct. Instead, how you construct and nest the XSL tags and statements are far more important. (9 marks)

c. The complete address book DTD (add.dtd) is shown below: (7 marks)

```xml
<?xml encoding="UTF-8"?>
<!ELEMENT addressBook (person)+>
<!ELEMENT person (name,email*,link?)>
<!ATTLIST person id ID #REQUIRED>
<!ATTLIST person gender (male|female) #IMPLIED>
<!ELEMENT name (#PCDATA|family|given)>
<!ELEMENT family (#PCDATA)>
<!ELEMENT given (#PCDATA)>
<!ELEMENT email (#PCDATA)>
<!ELEMENT link EMPTY>
<!ATTLIST link manager IDREF #IMPLIED>
<!ATTLIST link subordinates IDREFS #IMPLIED>
```

What are the functions of ID and IDREF attribute types?

Derive a valid XML document from the above DTD.