1. An HTTP dialogue made with nc program is shown in the following lines:

```
1 GET /nube.gif HTTP/1.1
2 Pragma: no-cache
3 Cache-control: no-cache
4 Accept:image/png, image/jpeg, video/x-mng, image/jp2, image/gif;q=0.5,*/*;q=0.1
5 Accept-Encoding: x-gzip, x-deflate, gzip, deflate
6 Accept-Charset: utf-8, utf-8;q=0.5, *;q=0.5
7 Accept-Language: es, en
8 Connection: Keep-Alive
9
10 <html><body><h1>404 Not Found</h1></body></html>
```

   a) Indicate for each line if it is sent by the client or by the server.
   b) Indicate which part(s) of the dialogue does not follow the standard application protocol.
   c) Rewrite the lines above in such a way that they follow the standard protocol, add lines if you consider it necessary.
   NOTE: Lines are numered to facilitate the exercise.

2. In the following cases:
   How many RTTs are needed to retrieve a web page made up by an html document, and four images, where two of the images are situated in a different web server?
   a) Use non persistent connections without pipelining.
   b) Use non persistent connections with a maximum of two concurrent connections.
   c) Use persistent connections without concurrent connections, and pipelining.
   Transmission delays are negligible. Draw the segments sent between the client and the server for each case.

3. In the following client/server dialogue:

```
220 out.telefonica.net ESMTP Service (7.2.056.6) ready
EHLO [192.168.1.33]
250-out.telefonica.net
250-DSN
250-8BITMIME
250-PIPELINING
250-HELP
250-X-CP-DELIVER-AFTER
250-DELIVERBY 300
250 SIZE 52428800
MAIL FROM:<pepu@telefonica.net> SIZE=376
250 MAIL FROM:<pepu@telefonica.net> OK
RCPT TO:<luis@telefonica.net>
250 RCPT TO:<luis@telefonica.net> OK
DATA
354 Start mail input; end with <CRLF>.<CRLF>
Message-ID: <47985FC8.30504@telefonica.net>
Date: Thu, 24 Jan 2008 10:52:08 +0100
From: <pepu@telefonica.net>
User-Agent: Mozilla Thunderbird 2.0.2 (Linux/20070317)
X-Accept-Language: en-us, en
MIME-Version: 1.0
To: luis@telefonica.net
Subject: prueba
```

```
Content-Type: text/plain; charset=ISO-8859-1; format=flowed
Content-Transfer-Encoding: 7bit
prueba 2
.
250 <4797C7CB0000E186> Mail accepted
QUIT
221   t.telefonica.net QUIT
```

a) Indicate the DNS query/queries that will be sent before to stablish the TCP connection if the DNS cache is empty (indicate type, source and destination of the DNS query, and what is asked in the DNS query).
b) Indicate how many RTTs are needed to carry out the previous dialogue, if each client request- server response need only one RTT, and the whole email message (lines between "**354 Start mail input; end with <CRLF>.**<CRLF>" and "**250 <4797C7CB0000E186> Mail accepted**") needs only one RTT. Draw the segments exchanged between client and server, showing also the RTTs.

4. In the following client/server dialogue:

```
220 hamburger.edu
HELO crepes.fr
250 Hello crepes.fr, pleased to meet you
MAIL FROM: <alice@crepes.fr>
250 alice@crepes.fr... Sender ok
RCPT TO: <bob@hamburger.edu>
250 bob@hamburger.edu ... Recipient ok
DATA
354 Enter mail, end with "." on a line by itself
Te apetece ir al cine?
A ver dos policias rebeldes II?
.
250 Message accepted for delivery
QUIT
221 hamburger.edu closing connection
```

a) Which is protocol used by client and server?
b) What is this protocol used for?
c) Indicate who (client/server) sends each line

5. The user sender@upv.es configure his mail agent to send and receive emails through two servers: imap.upv.es and smtp.upv.es, both at the upv LAN (Local Area Network). sender@upv.es wants to send an email to receiver@ya.com (that belongs to another mail domain).
Fill in the following table indicating the client/server messages send until the email goes out the UPV.
Note:
   - The DNS server of the upv domain (dns.upv.es) has the mapping information (domains-IP address) for all the TLD servers needed in the queries that it will make. However, the DNS caches of other hosts have not the needed information.

- If you need to name other servers, you can name them with the protocol that they use, and the domain where they are, i.e. protocol: dns, domain: upv.es, name of the server: dns.upv.es)

Source Host	Destination Host	Application Protocol	Objective (Request/Response, Type of register)

6. Fill in the following table indicating the sequence of DNS messages (query and response) send when a user in ONO domain, with dns.ono.com as local dns server, try to download the index.html web page from www.redes.upv.es web server. In this web page, is reference an image with the link http://www.upv.es/image/logo.gif
   Note:
   - The DNS server of the ono domain (dns.ono.com) has the mapping information (domains-IP address) for all the TLD servers needed in the queries that it will make. However, the DNS caches of other hosts have not the needed information.
   - The UPV DNS server, dns.upv.es, is the authoritative dns server for the upv.es domain, and any subdomain included in the upv.es domain.
   - If you need to name other servers, you can name them with the protocol that they use, and the domain where they are, i.e. protocol: dns, domain: upv.es, name of the server: dns.upv.es) or the TLD for the .es domain will be TLD.es

Source Host	Destination Host	Application Protocol	Objective (Request/Response, Type of register)

7. What is MIME used for?
8. How many RTTs are needed to retrieve a web page made up by an html document, and three images, if all the objects are in the same web server, and the HTTP version is 1.1 with pipelining? And if the images are in a different web server?
9. What is the information in a dns server record of type MX? What is the server that makes queries of type MX and why are they made?
10. What is a proxy server? Which are the advantages that proxies provide?
11. What is POP3 protocol used for? Which are the alternative protocols to get the same result?

12. SMTP protocol doesn't require client authentication. Should external clients of the organization that manages the SMTP server be allowed to open a SMTP session on it? Why? Which are the actions that should be allowed to carry out to these external clients?
13. How can a web server know the browser (Chrome, Firefox, Internet Explorer,etc.) used by the client? Can a web server know it always?