Third midterm. Xarxes de Computadors (XC), Grau en Enginyeria Informàtica		08/06/2017	Spring 2017
NAME (in CAPITAL LETTERS):	FAMILY NAME / SURNAME (in CAPITAL LETTERS):	GRUP:	ID (DNI/NIE):

Duration: 1 hour 30 minutes. The quiz will be collected in 25 minutes.

Test (4 points).
All questions are multiple choice. Count as half if there is one error, zero if more than one error.

1. About DNS protocol (typical configuration)
- ☐ All clients (user's devices) must know the IP address of one DNS server (local or provided by the ISP)
- ☐ All clients (user's devices) must know the IP addresses of the "*root servers*"
- ☐ If a DNS server with an empty cache does not have the response to a request sends a DNS *Request* message in iterative mode to the "*root server*"
- ☐ A local DNS server acts as client of DNS *root* servers and TLD DNS servers

2. About DNS protocol
- ☐ The configuration file of the domain's authority must include always the resource records (RR) of the types NS, MX, CNAME and A
- ☐ A single host may have several IP addresses and several different names
- ☐ Aliases are defined by means of RR of type NS
- ☐ A CNAME register (RR) is used to assign an alternative name of a "*Canonical Name*"

3. About SMTP protocol
- ☐ SMTP may use UDP or TCP as transport protocol
- ☐ In case both email end users (sender and receiver) use a web browser (such as *webmail*), some SMTP transactions are needed
- ☐ SMTP is used both to send and receive electronic mail
- ☐ Some of the commands of the protocol are: HELO, MAIL FROM, DATA and QUIT

4. About the electronic mail service
- ☐ All messages using MIME are always encrypted
- ☐ The local email server will look for the IP address of the destination domain's email server asking iteratively for the CNAME registers to the root server, to the TLD server and to the servers of the subsequent subdomains
- ☐ MIME is an extension of the electronic mail message format that allows the exchange of binary information coded in 7 bits (ASCII)
- ☐ A MIME message may include several parts with different types of messages which are specified by the "*boundary*"

5. About a client with HTTP 1.1 (persistent)
- ☐ It may establish several TCP connections to different HTTP servers
- ☐ Establishes a TCP connection for each object it requests to the server
- ☐ Uses the commands GET or POST for requesting contents to the server
- ☐ The POST command carries data that are sent to the server

6. About HTTP protocol
- ☐ Uses MIME to exchange different types of information
- ☐ Does request-reply transactions and for this reason it uses UDP as transport protocol
- ☐ A *Proxy cache* uses the conditional GET command with the attributes "*If-modified-since*" and/or *"If-none-match*"
- ☐ A *Proxy cache* stores the downloaded objects and blocks the access to the original server

7. A small company registers the domain *LaMevaEmpresa.cat*, its web page is located at *www445.hosting.com* and the electronic mail is *LaMevaEmpresa@gmail.com.* The DNS database of *LaMevaEmpresa.cat*
- ☐ Contains a MX register with the IP address of a Gmail mail server
- ☐ Contains an A register such as: www A @IP of www445.hosting.com
- ☐ Contains an A register such as: www A www445.hosting.com
- ☐ May contain a NS register such as: LaMevaEmpresa.cat NS ns1.hosting.com

8. About UNICODE
- ☐ The first 128 codes are the same as ASCII codes
- ☐ It defines a unique code for each character and graphical symbol using 7 bits per octet
- ☐ In UTF-8 a character may require one, two, three or four octets
- ☐ UTF-8 is a *charset* that is not incompatible with MIME

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Duration: 1h30m. The quiz will be collected in 25 minutes. Answer in the same questions sheet.

Question 1 (3 points)

We receive an email with a text that has 3 letters: "Hi" followed by the letter U+1F600 (grinning face). The body of the message contains these three letters encoded as follows:

```
Content-Type: multipart/alternative; boundary="94eb6"

--94eb6
Content-Type: text/plain; charset="UTF-8"
Content-Transfer-Encoding: base64

SGnwn5iA
--94eb6
Content-Type: text/html; charset="UTF-8"
Content-Transfer-Encoding: quoted-printable

<p>Hi=F0=9F=98=80</p>

--94eb6--
```

a) (0.5 points) Why does the message contain a multipart object?

b) (0.5 points) Can the text «boundary» appear in the content of any object? Why? How to choose the «boundary»?

c) (0.5 points) How many bytes has the UTF-8 encoding of the text and why?

d) (0.5 points) What SMTP command is used to tranfer the body of the message?

e) (1 points) We want to implement a mail service for a domain that has two SMTP servers that share its load evenly. Describe the values you would assign (format: name TYPE value) to the resource records of type NS, A and MX in DNS to implement that domain, and explain its rationale.
Data to use in the answer: domain.org, servers: s1.hosting.com .. s5.hosting.com, IPs: 1.2.3.4 .. 1.2.3.8

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Problem 2 (3 points)

A (1,5 points) A user downloads a form (index.html) from a server www.a.com. The form requests for the name and surname (variables "name" and "surname"). The action of the form is calling the page "dades.php" from the server sending the value of the variables. The user fills out the form with the values "Antonio" "Gaudi" and sends it to the server. Below are the messages S1 ... S4 exchanged between the client and the server. Fill a possible content for the missing data in the messages sent by the client. Each cell is a separate line of the message. There may be more cells than necessary. Take into account that the MIME type "Content-Type: application / x-www-form-urlencoded" specifies the format of the "query-string" in a URL. Invent the data may be missing.

S1. Client

Host: www.a.com
User-Agent: Mozilla
Accept: text/html

S2. Server

HTTP/1.1 200 OK
....

S3. Client

Host: www.a.com
User-Agent: Mozilla
Accept: text/html
Content-Type: application/x-www-form-urlencoded

S4. Server

HTTP/1.1 200 OK
....

B (1,5 points) Make a time diagram of all **UDP/TCP messages** that are generated since the user enters the URL www.a.com in the browser until the connection with the server is closed. Use S1, S2, S3, S4 to refer to the previous messages. If the RTT is 1 second and the user takes 10 seconds to enter the data in the form, compute approximately the time elapsed since the client enters the URL until it receives S4 (indicate it in the diagram). Comment the assumptions you make.