Exercise 3

No.	Time	Source	Destination	Protocol	Length	Info
10	4.694850	192.168.1.102	128.119.245.12	HTTP	555	GET /ethereal-labs/lab2-1.html HTTP/1.1
12	4.718993	128.119.245.12	192.168.1.102	HTTP	439	HTTP/1.1 200 OK (text/html)
13	4.724332	192.168.1.102	128.119.245.12	HTTP	541	GET /favicon.ico HTTP/1.1
14	4.750366	128.119.245.12	192.168.1.102	HTTP	1395	HTTP/1.1 404 Not Found (text/html)

▶ Frame 10: 555 bytes on wire (4440 bits), 555 bytes captured (4440 bits)
▶ Ethernet II, Src: Dell_4f:36:23 (00:08:74:4f:36:23), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)
▶ Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12
▶ Transmission Control Protocol, Src Port: 4127, Dst Port: 80, Seq: 1, Ack: 1, Len: 501
▼ Hypertext Transfer Protocol
  ▶ GET /ethereal-labs/lab2-1.html HTTP/1.1\r\n
    Host: gaia.cs.umass.edu\r\n
    User-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.0.2) Gecko/20021120 Netscape/7.01\r\n
    Accept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,text/plain;q=0.8,video/x-mng,image/png,image/jpeg,image/gif;q=0.2,te…
    Accept-Language: en-us, en;q=0.50\r\n
    Accept-Encoding: gzip, deflate, compress;q=0.9\r\n
    Accept-Charset: ISO-8859-1, utf-8;q=0.66, *;q=0.66\r\n
    Keep-Alive: 300\r\n
    Connection: keep-alive\r\n
    \r\n
    [Full request URI: http://gaia.cs.umass.edu/ethereal-labs/lab2-1.html]
    [HTTP request 1/2]
    [Response in frame: 12]
    [Next request in frame: 13]

No.	Time	Source	Destination	Protocol	Length	Info
10	4.694850	192.168.1.102	128.119.245.12	HTTP	555	GET /ethereal-labs/lab2-1.html HTTP/1.1
12	4.718993	128.119.245.12	192.168.1.102	HTTP	439	HTTP/1.1 200 OK (text/html)
13	4.724332	192.168.1.102	128.119.245.12	HTTP	541	GET /favicon.ico HTTP/1.1
14	4.750366	128.119.245.12	192.168.1.102	HTTP	1395	HTTP/1.1 404 Not Found (text/html)

▼ Hypertext Transfer Protocol
  ▶ HTTP/1.1 200 OK\r\n
    Date: Tue, 23 Sep 2003 05:29:50 GMT\r\n
    Server: Apache/2.0.40 (Red Hat Linux)\r\n
    Last-Modified: Tue, 23 Sep 2003 05:29:00 GMT\r\n
    ETag: "1bfed-49-79d5bf00"\r\n
    Accept-Ranges: bytes\r\n
  ▶ Content-Length: 73\r\n
    Keep-Alive: timeout=10, max=100\r\n
    Connection: Keep-Alive\r\n
    Content-Type: text/html; charset=ISO-8859-1\r\n
    \r\n
    [HTTP response 1/2]
    [Time since request: 0.024143000 seconds]
    [Request in frame: 10]
    [Next request in frame: 13]
    [Next response in frame: 14]
    [Request URI: http://gaia.cs.umass.edu/favicon.ico]
    File Data: 73 bytes
  ▶ Line-based text data: text/html (3 lines)

Question 1:

The status code is 200, the phrase is "OK".

Question 2:

The HTML file was last modified at Tue, 23 Sep 2003 05:29:00 GMT.

The Date header is Tue, 23 Sep 2003 05:29:50 GMT

The Last modified field is the time when the HTML file was last modified at

the origin server and the Date field is when the response was last sent.

Question 3:

The connection is persistent because the Connection header is "Keep-

Alive".

The Connection general header controls whether or not the network

connection stays open after the current transaction finishes. If the value

sent is keep-alive, it indicates that the client would like to keep the

connection open.

Question 4:

According to content-length header, there are 73 bytes content returned
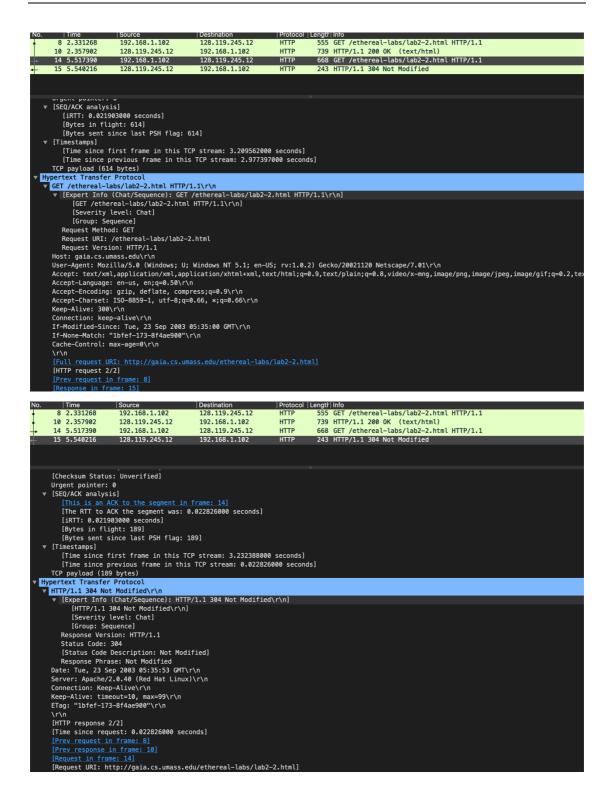
to the browser.

Question 5:

It contains a HTML text file:

1. **<html>**\n

2. Congratulations. You've downloaded the file lab2-1.html!\n

3. **</html>**\n

Exercise 4

No.	Time	Source	Destination	Protocol	Length	Info
8	2.331268	192.168.1.102	128.119.245.12	HTTP	555	GET /ethereal-labs/lab2-2.html HTTP/1.1
10	2.357902	128.119.245.12	192.168.1.102	HTTP	739	HTTP/1.1 200 OK (text/html)
14	5.517390	192.168.1.102	128.119.245.12	HTTP	668	GET /ethereal-labs/lab2-2.html HTTP/1.1
15	5.540216	128.119.245.12	192.168.1.102	HTTP	243	HTTP/1.1 304 Not Modified

```
▶ Frame 8: 555 bytes on wire (4440 bits), 555 bytes captured (4440 bits)
▶ Ethernet II, Src: Dell_4f:36:23 (00:08:74:4f:36:23), Dst: LinksysG_da:af:73 (00:06:25:da:af:73)
▶ Internet Protocol Version 4, Src: 192.168.1.102, Dst: 128.119.245.12
▶ Transmission Control Protocol, Src Port: 4247, Dst Port: 80, Seq: 1, Ack: 1, Len: 501
▼ Hypertext Transfer Protocol
  ▼ GET /ethereal-labs/lab2-2.html HTTP/1.1\r\n
    ▶ [Expert Info (Chat/Sequence): GET /ethereal-labs/lab2-2.html HTTP/1.1\r\n]
      Request Method: GET
      Request URI: /ethereal-labs/lab2-2.html
      Request Version: HTTP/1.1
    Host: gaia.cs.umass.edu\r\n
    User-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.0.2) Gecko/20021120 Netscape/7.01\r\n
    Accept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,text/plain;q=0.8,video/x-mng,image/png,image/jpeg,image/gif;q=0.2,text
    Accept-Language: en-us, en;q=0.50\r\n
    Accept-Encoding: gzip, deflate, compress;q=0.9\r\n
    Accept-Charset: ISO-8859-1, utf-8;q=0.66, *;q=0.66\r\n
    Keep-Alive: 300\r\n
    Connection: keep-alive\r\n
    \r\n
    [Full request URI: http://gaia.cs.umass.edu/ethereal-labs/lab2-2.html]
    [HTTP request 1/2]
    [Response in frame: 10]
    [Next request in frame: 14]
```

No.	Time	Source	Destination	Protocol	Length	Info
8	2.331268	192.168.1.102	128.119.245.12	HTTP	555	GET /ethereal-labs/lab2-2.html HTTP/1.1
10	2.357902	128.119.245.12	192.168.1.102	HTTP	739	HTTP/1.1 200 OK (text/html)
14	5.517390	192.168.1.102	128.119.245.12	HTTP	668	GET /ethereal-labs/lab2-2.html HTTP/1.1
15	5.540216	128.119.245.12	192.168.1.102	HTTP	243	HTTP/1.1 304 Not Modified

```
  ▼ [SEQ/ACK analysis]
      [iRTT: 0.021903000 seconds]
      [Bytes in flight: 685]
      [Bytes sent since last PSH flag: 685]
  ▼ [Timestamps]
      [Time since first frame in this TCP stream: 0.050074000 seconds]
      [Time since previous frame in this TCP stream: 0.002177000 seconds]
    TCP payload (685 bytes)
▼ Hypertext Transfer Protocol
  ▼ HTTP/1.1 200 OK\r\n
    ▼ [Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\n]
        [HTTP/1.1 200 OK\r\n]
        [Severity level: Chat]
        [Group: Sequence]
      Response Version: HTTP/1.1
      Status Code: 200
      [Status Code Description: OK]
      Response Phrase: OK
    Date: Tue, 23 Sep 2003 05:35:50 GMT\r\n
    Server: Apache/2.0.40 (Red Hat Linux)\r\n
    Last-Modified: Tue, 23 Sep 2003 05:35:00 GMT\r\n
    ETag: "1bfef-173-8f4ae900"\r\n
    Accept-Ranges: bytes\r\n
  ▼ Content-Length: 371\r\n
      [Content length: 371]
    Keep-Alive: timeout=10, max=100\r\n
    Connection: Keep-Alive\r\n
    Content-Type: text/html; charset=ISO-8859-1\r\n
    \r\n
    [HTTP response 1/2]
    [Time since request: 0.026634000 seconds]
    [Request in frame: 8]
    [Next request in frame: 14]
    [Next response in frame: 15]
    [Request URI: http://gaia.cs.umass.edu/ethereal-labs/lab2-2.html]
    File Data: 371 bytes
▼ Line-based text data: text/html (10 lines)
    \n
    <html>\n
    \n
    Congratulations again!  Now you've downloaded the file lab2-2.html. <br>\n
    This file's last modification date will not change.  <p>\n
    Thus  if you download this multiple times on your browser, a complete copy <br>\n
    will only be sent once by the server due to the inclusion of the IN-MODIFIED-SINCE<br>\n
    field in your browser's HTTP GET request to the server.\n
    \n
    </html>\n
```

No.	Time	Source	Destination	Protocol	Length	Info
8	2.331268	192.168.1.102	128.119.245.12	HTTP	555	GET /ethereal-labs/lab2-2.html HTTP/1.1
10	2.357902	128.119.245.12	192.168.1.102	HTTP	739	HTTP/1.1 200 OK (text/html)
14	5.517390	192.168.1.102	128.119.245.12	HTTP	668	GET /ethereal-labs/lab2-2.html HTTP/1.1
15	5.540216	128.119.245.12	192.168.1.102	HTTP	243	HTTP/1.1 304 Not Modified

```
    urgent pointer: 0
  ▼ [SEQ/ACK analysis]
      [iRTT: 0.021903000 seconds]
      [Bytes in flight: 614]
      [Bytes sent since last PSH flag: 614]
  ▼ [Timestamps]
      [Time since first frame in this TCP stream: 3.209562000 seconds]
      [Time since previous frame in this TCP stream: 2.977397000 seconds]
    TCP payload (614 bytes)
▼ Hypertext Transfer Protocol
  ▼ GET /ethereal-labs/lab2-2.html HTTP/1.1\r\n
    ▼ [Expert Info (Chat/Sequence): GET /ethereal-labs/lab2-2.html HTTP/1.1\r\n]
        [GET /ethereal-labs/lab2-2.html HTTP/1.1\r\n]
        [Severity level: Chat]
        [Group: Sequence]
      Request Method: GET
      Request URI: /ethereal-labs/lab2-2.html
      Request Version: HTTP/1.1
    Host: gaia.cs.umass.edu\r\n
    User-Agent: Mozilla/5.0 (Windows; U; Windows NT 5.1; en-US; rv:1.0.2) Gecko/20021120 Netscape/7.01\r\n
    Accept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,text/plain;q=0.8,video/x-mng,image/png,image/jpeg,image/gif;q=0.2,tex
    Accept-Language: en-us, en;q=0.50\r\n
    Accept-Encoding: gzip, deflate, compress;q=0.9\r\n
    Accept-Charset: ISO-8859-1, utf-8;q=0.66, *;q=0.66\r\n
    Keep-Alive: 300\r\n
    Connection: keep-alive\r\n
    If-Modified-Since: Tue, 23 Sep 2003 05:35:00 GMT\r\n
    If-None-Match: "1bfef-173-8f4ae900"\r\n
    Cache-Control: max-age=0\r\n
    \r\n
    [Full request URI: http://gaia.cs.umass.edu/ethereal-labs/lab2-2.html]
    [HTTP request 2/2]
    [Prev request in frame: 8]
    [Response in frame: 15]
```

No.	Time	Source	Destination	Protocol	Length	Info
8	2.331268	192.168.1.102	128.119.245.12	HTTP	555	GET /ethereal-labs/lab2-2.html HTTP/1.1
10	2.357902	128.119.245.12	192.168.1.102	HTTP	739	HTTP/1.1 200 OK (text/html)
14	5.517390	192.168.1.102	128.119.245.12	HTTP	668	GET /ethereal-labs/lab2-2.html HTTP/1.1
15	5.540216	128.119.245.12	192.168.1.102	HTTP	243	HTTP/1.1 304 Not Modified

```
    [Checksum Status: Unverified]
    Urgent pointer: 0
  ▼ [SEQ/ACK analysis]
      [This is an ACK to the segment in frame: 14]
      [The RTT to ACK the segment was: 0.022826000 seconds]
      [iRTT: 0.021903000 seconds]
      [Bytes in flight: 189]
      [Bytes sent since last PSH flag: 189]
  ▼ [Timestamps]
      [Time since first frame in this TCP stream: 3.232388000 seconds]
      [Time since previous frame in this TCP stream: 0.022826000 seconds]
    TCP payload (189 bytes)
▼ Hypertext Transfer Protocol
  ▼ HTTP/1.1 304 Not Modified\r\n
    ▼ [Expert Info (Chat/Sequence): HTTP/1.1 304 Not Modified\r\n]
        [HTTP/1.1 304 Not Modified\r\n]
        [Severity level: Chat]
        [Group: Sequence]
      Response Version: HTTP/1.1
      Status Code: 304
      [Status Code Description: Not Modified]
      Response Phrase: Not Modified
    Date: Tue, 23 Sep 2003 05:35:53 GMT\r\n
    Server: Apache/2.0.40 (Red Hat Linux)\r\n
    Connection: Keep-Alive\r\n
    Keep-Alive: timeout=10, max=99\r\n
    ETag: "1bfef-173-8f4ae900"\r\n
    \r\n
    [HTTP response 2/2]
    [Time since request: 0.022826000 seconds]
    [Prev request in frame: 8]
    [Prev response in frame: 10]
    [Request in frame: 14]
    [Request URI: http://gaia.cs.umass.edu/ethereal-labs/lab2-2.html]
```

Question1:

No, there is no "IF-MODIFIED-SINCE" field in the first HTTP GET request.

Question2:

Yes, it's Tue, 23 Sep 2003 05:35:00 GMT.

Question3:

Yes, the lines:

1. If-Modified-Since: Tue, 23 Sep 2003 05:35:00 GMT

2. If-None-Match: "1bfef-173-8f4ae900"

The "IF-MODIFIED-SINCE" field tells the last modified date of the

requested resource and it makes the request conditional: the server will

send back the requested resource, with a 200 status, only if it has been last

modified after the given date. If the request has not been modified since,

the response will be a 304 without any body.

The "IF-NONE-MATCH" field tells us the Etag of a specific version of a

resource and it   makes the request conditional. For GET and HEAD

methods, the server will send back the requested resource, with a 200

status, only if it doesn't have an ETag matching the given ones. For other

methods, the request will be processed only if the eventually existing

resource's ETag doesn't match any of the values listed.

Question4:

The status code is 304 and phrase is Not Modified.

The server did not return the contents of the file.

Because the request is conditional and the server will send back the

requested resource, with a 200 status, only if it has been last modified

after the given date. If the request has not been modified since, the

response will be a 304 without any body.

Question5:

The value of the Etag field in the 2nd response message is "1bfef-173-

8f4ae900" and it is the same as the first response.

The If-None-Match HTTP request header makes the request conditional.

For GET and HEAD methods, the server will send back the requested

resource, with a 200 status, only if it doesn't have an ETag matching the

given ones. For other methods, the request will be processed only if the

eventually existing resource's ETag doesn't match any of the values listed.

Exercise 5

```python
1.   #!/usr/bin/python
2.
3.   import socket
4.   import sys
5.   import datetime
6.
7.   def main():
8.       if len(sys.argv) != 3:
9.           print("Parameters ERROR!")
10.          sys.exit(1)
11.
12.      addr = (sys.argv[1], int(sys.argv[2]))
13.      rtts = []
14.
15.      for i in range(10):
16.          client = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)
17.          client.settimeout(1)
18.          send_time = datetime.datetime.now()
19.          client.sendto("PING {} {} \r\n".format(i, send_time).encode(), addr)
20.
21.          try:
22.              resp_data, server_addr = client.recvfrom(2048)
23.              rtt = round(((datetime.datetime.now() - send_time).total_seconds() * 1000))
24.              rtts.append(rtt)
25.              print('ping to {}, seq = {}, rtt = {} ms'.format(addr[0], i, rtt))
26.          except socket.timeout:
27.              print('ping to {}, seq = {}, time out'.format(addr[0], i))
28.
29.      if len(rtts) != 0:
30.          print('round-trip min/avg/max = {}/{}/{} ms'.format(min(rtts), sum(rtts)/len(rtts), max(rtts)))
31.      else:
32.          print('All of 10 packages are lost')
33.
34.  if __name__ == "__main__":
35.      main()
```