Exercise 3:

Q1:

The status code is 200 and phrase returned from the server is OK.

Q2:

Last modified time is Tue, 23 Sep 2003 05:29:00 GMT. And the response contains a DATE header with description Tue, 23 Sep 2003 05:29:50 GMT. The time in DATE header is the time that the response message was originated while the Last modified time is the time that requested file last modified.

Q3:

The connection is persistent by looking at the Connection header which has description Keep-Alive.

Q4:

By observe Content-Length header, there are 73 bytes of content are being returned to the browser.

Q5:

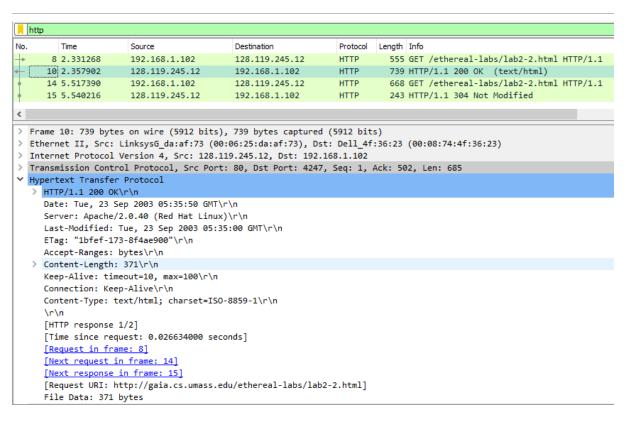The data contained inside the HTTP response packet is

> <html>\n
>
> Congratulations.   You've downloaded the file lab2-1.html!\n
>
> </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
    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/css,*/*;q=0.1\r\n
    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

```
> Frame 10: 739 bytes on wire (5912 bits), 739 bytes captured (5912 bits)
> Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: Dell_4f:36:23 (00:08:74:4f:36:23)
> Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.1.102
> Transmission Control Protocol, Src Port: 80, Dst Port: 4247, Seq: 1, Ack: 502, Len: 685
∨ Hypertext Transfer Protocol
  > HTTP/1.1 200 OK\r\n
    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
    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
```

```
http

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 14: 668 bytes on wire (5344 bits), 668 bytes captured (5344 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: 502, Ack: 686, Len: 614
∨ Hypertext Transfer Protocol
    > GET /ethereal-labs/lab2-2.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/jp
      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]

```
http

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 15: 243 bytes on wire (1944 bits), 243 bytes captured (1944 bits)
> Ethernet II, Src: LinksysG_da:af:73 (00:06:25:da:af:73), Dst: Dell_4f:36:23 (00:08:74:4f:36:23)
> Internet Protocol Version 4, Src: 128.119.245.12, Dst: 192.168.1.102
> Transmission Control Protocol, Src Port: 80, Dst Port: 4247, Seq: 686, Ack: 1116, Len: 189
∨ Hypertext Transfer Protocol
    > HTTP/1.1 304 Not Modified\r\n
      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]

Q1:

By observe the first HTTP GET request from the browser to the server, there is no IF-MODIFIED-SINCE line. Since this is the very first request so user can't generate IF-MODIFIED-SINCE line.

Q2:

Yes, the Last-Modified time is Tue, 23 Sep 2003 05:35:00 GMT.

Q3:

The second request contain "IF-MODIFIED-SINCE:" and "IF-NONE-MATCH" lines in the HTTP GET. The IF-MODIFIED-SINCE line contains the Last-Modified time from pervious request, and the IF-

NONE-MATCH line contains the Etag value from pervious request which probably is the hash value of the requested file.

Q4:

The second response has status code 304 and phrase Not Modified. The server didn't explicitly return the contents of the file, cause base on the IF-NONE-MATCH and IF-MODIFIED-SINCE lines in the second HTTP GET request, the serve find out the requested file didn't change since last request.

Q5:

Etag value in the 2nd response message is 1bfef-173-8f4ae900 and it used to compare with the IF-NONE-MATCH line from the second HTTP GET request to find if the file changed since last request. This value didn't change since the 1st response message was received.

Exercise 5 output:

```
z5266153@vx7:/tmp_amd/kamen/export/kamen/4/z5266153/Documents/comp3331/Lab2$ python3 PingClient.py 127.0.0.1 4000
3331 PING to 127.0.0.1, seq = 0, rtt = 169 ms
3331 PING to 127.0.0.1, seq = 1, rtt = time out
3331 PING to 127.0.0.1, seq = 2, rtt = 140 ms
3331 PING to 127.0.0.1, seq = 3, rtt = 130 ms
3331 PING to 127.0.0.1, seq = 4, rtt = time out
3331 PING to 127.0.0.1, seq = 5, rtt = time out
3331 PING to 127.0.0.1, seq = 6, rtt = 107 ms
3331 PING to 127.0.0.1, seq = 7, rtt = time out
3331 PING to 127.0.0.1, seq = 8, rtt = time out
3331 PING to 127.0.0.1, seq = 9, rtt = 158 ms
3331 PING to 127.0.0.1, seq = 10, rtt = time out
3331 PING to 127.0.0.1, seq = 11, rtt = time out
3331 PING to 127.0.0.1, seq = 12, rtt = 189 ms
3331 PING to 127.0.0.1, seq = 13, rtt = 175 ms
3331 PING to 127.0.0.1, seq = 14, rtt = 24 ms


Minimum RTT = 24 ms
Maximum RTT = 189 ms
Average RTT = 136 ms
53.3% of packets have been lost through the network
```