Exercise 3

Question 1

- Status code: 200
- Phrase: OK

Question 2

- Last modified: Tue, 23 Sep 2003 05:29:00 GMT
- It does contain a DATE header
- The Last-Modified response HTTP header contains the date and time at which the origin server believes the resource was last modified. It is used as a validator to determine if a resource received or stored is the same. Where as the Date general HTTP header contains the date and time at which the message was originated.

Question 3

- Persistent connection.
- Persistent connection means the channel while remain open for more requests. To maintain a persistent connection, TCP keep-alive packets are sent to prevent the connection from timing out. In this header, there is a keep-alive header with timeout=10, max=100.

Question 4

- 73 bytes

Question 5

- Data in the response packet is a html file, of type: text/html.

```
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 05:29:50 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
```

Exercise 4

Question 1

- No

```
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
v Hypertext Transfer Protocol
    v 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/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]
```

Question 2

- Yes, Tue, 23 Sep 2003 05:35:50 GMT


```
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 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
v Hypertext Transfer Protocol
    v HTTP/1.1 200 OK\r\n
      > [Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\n]
        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
      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
  v Line-based text data: text/html (10 lines)
      \n
      <html>\n
      \n
```

Question 3

- Yes.
  - If-Modified-Since: Tue, 23 Sep 05:35:00
  - If-None-Match: 1bfef-173-8f4ae900


```
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
v Hypertext Transfer Protocol
    v 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/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
      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]
```
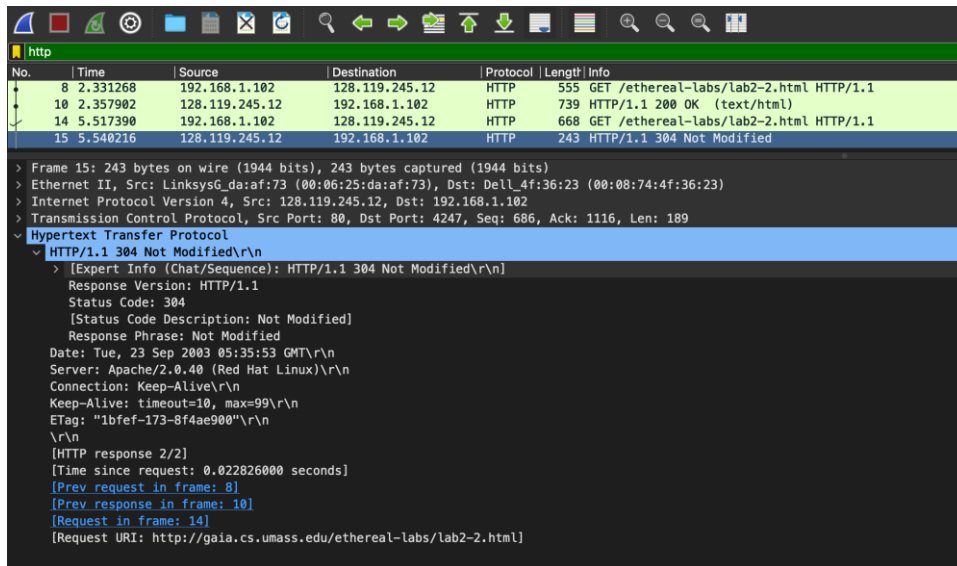
Question 4

- Status code: 304
- Phrase: Not Modified
- The server doesn't return the content of the file because the If-Modified-Since condition is unsatisfied, as If-Modified-Since is Tue, 23 Sep 05:35:00, which is the same as Last-Modified of the resource. When the resource is not modified after IF-MODIFIED-SINCE, the response will be a 304 without any body. Also, the request is GET, and there is an ETag, which makes the IF-NONE-MATCH condition fails as well.

Question 5

- ETag: 1bfef-173-8f4ae900
- ETag is used in IF-NONE-MATCH condition. If there is an IF-NONE-MATCH condition check, 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.
- This value remains the same as last response message. Evidence in pictures under Q2 and Q4.

Exercise 5

Output of client:

```
(base) macdeMacBook-Air:3331 lab2 mac$ python PingClient.py 127.0.0.1 5000
ping to 127.0.0.1, seq = 0, rtt = timeout
ping to 127.0.0.1, seq = 1, rtt = 70ms
ping to 127.0.0.1, seq = 2, rtt = 137ms
ping to 127.0.0.1, seq = 3, rtt = 62ms
ping to 127.0.0.1, seq = 4, rtt = 68ms
ping to 127.0.0.1, seq = 5, rtt = timeout
ping to 127.0.0.1, seq = 6, rtt = timeout
ping to 127.0.0.1, seq = 7, rtt = timeout
ping to 127.0.0.1, seq = 8, rtt = 47ms
ping to 127.0.0.1, seq = 9, rtt = 4ms
ping to 127.0.0.1, seq = 10, rtt = timeout
ping to 127.0.0.1, seq = 11, rtt = 166ms
ping to 127.0.0.1, seq = 12, rtt = 6ms
ping to 127.0.0.1, seq = 13, rtt = 86ms
ping to 127.0.0.1, seq = 14, rtt = timeout
minimum rtt = 4ms, average rtt = 71ms, maximum rtt = 166ms
```

Output of server:

```
(base) macdeMacBook-Air:3331 lab2 mac$ java PingServer 5000
Received from 127.0.0.1: PING 3331 2021-06-22 07:55:13.605985
    Reply not sent.
Received from 127.0.0.1: PING 3332 2021-06-22 07:55:14.210786
    Reply sent.
Received from 127.0.0.1: PING 3333 2021-06-22 07:55:14.281596
    Reply sent.
Received from 127.0.0.1: PING 3334 2021-06-22 07:55:14.418995
    Reply sent.
Received from 127.0.0.1: PING 3335 2021-06-22 07:55:14.482348
    Reply sent.
Received from 127.0.0.1: PING 3336 2021-06-22 07:55:14.551541
    Reply not sent.
Received from 127.0.0.1: PING 3337 2021-06-22 07:55:15.152555
    Reply not sent.
Received from 127.0.0.1: PING 3338 2021-06-22 07:55:15.756828
    Reply not sent.
Received from 127.0.0.1: PING 3339 2021-06-22 07:55:16.358649
    Reply sent.
Received from 127.0.0.1: PING 3340 2021-06-22 07:55:16.406107
    Reply sent.
Received from 127.0.0.1: PING 3341 2021-06-22 07:55:16.410464
    Reply not sent.
Received from 127.0.0.1: PING 3342 2021-06-22 07:55:17.011828
    Reply sent.
Received from 127.0.0.1: PING 3343 2021-06-22 07:55:17.178335
    Reply sent.
Received from 127.0.0.1: PING 3344 2021-06-22 07:55:17.185316
    Reply sent.
Received from 127.0.0.1: PING 3345 2021-06-22 07:55:17.272690
    Reply not sent.
```