Problem 1.10

Consider a packet of length L which begins at end system A and travels over three links to a destination end system.

- These three links are connected by two packet switches. Let $d_i$, $s_i$, and $R_i$ denote the length, propagation speed, and the transmission rate of link $i$, for $i = 1, 2, 3$.
- The packet switch delays each packet by $d_{proc}$. Assuming no queuing delays, in terms of $d_i$, $s_i$, $R_i$, ($i = 1, 2, 3$), and $L$, what is the total end-to-end delay for the packet?

Suppose now the packet is 1,500 bytes, the propagation speed on all three links is $2.5 \cdot 10^8$ m/s, the transmission rates of all three links are 2 Mbps, the packet switch processing delay is 3 msec, the length of the first link is 5,000 km, the length of the second link is 4,000 km, and the length of the last link is 1,000 km.

For these values, what is the end-to-end delay?
Problem 2.4

Consider the following string of ASCII characters that were captured by Wireshark when the browser sent an HTTP GET message (i.e., this is the actual content of an HTTP GET message).

- The characters `<cr>` `<lf>` are carriage return and line-feed characters
- that is, the italicized character string `<cr>` in the text below represents the single carriage-return character that was contained at that point in the HTTP header

Answer the following questions, indicating where in the HTTP GET message below you find the answer.

```
GET /cs453/index.html HTTP/1.1<cr><lf>Host: gai.a.cs.umass.edu<cr><lf>User-Agent: Mozilla/5.0 (Windows;U; Windows NT 5.1; en-US; rv:1.7.2) Gecko/20040804 Netscape/7.2 (ax) <cr><lf>Accept:ext/xml, application/xml, application/xhtml+xml, text/html;q=0.9, text/plain;q=0.8,image/png,*/*;q=0.5 <cr><lf>Accept-Language: en-us,en;q=0.5<cr><lf>Accept-Encoding: zip, deflate<cr><lf>Accept-Charset: ISO-8859-1, utf-8;q=0.7, *;q=0.7<cr><lf>Keep-Alive: 300<cr><lf>Connection: keep-alive<cr><lf><cr><lf>
```
Problem 2.5

The text below shows the reply sent from the server in response to the HTTP GET message in the question above.

Answer the following questions, indicating where in the message below you find the answer.

HTTP/1.1 200 OK
Date: Tue, 07 Mar 2008 12:39:45 GMT
Server: Apache/2.0.52 (Fedora)
Last-Modified: Sat, 10 Dec 2005 18:27:46 GMT
ETag: "526c3-f22-a88a4c80"
Accept-Ranges: bytes
Content-Length: 3874
Keep-Alive: timeout=max=100
Connection: Keep-Alive
Content-Type: text/html; charset=ISO-8859-1
<!DOCTYPE html PUBLIC "-//w3c//dtd html 4.0 transitional//en">
<html><head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
<meta name="GENERATOR" content="Mozilla/4.79 [en] (Windows NT 5.0; U) Netscape">
<title>CMPSCI 453 / 591 / NTU-ST550A Spring 2005 homepage</title>
</head>
much more document text following here (not shown)