ASSIGNMENT NO *3* SOLUTION

Problem 1

a) F
b) T
c) F
d) F
e) F

Problem 3

Application layer protocols: DNS and HTTP
Transport layer protocols: UDP for DNS; TCP for HTTP

Problem 6

a) Persistent connections are discussed in section 8 of RFC 2616 (the real goal of this question was to get you to retrieve and read an RFC). Sections 8.1.2 and 8.1.2.1 of the RFC indicate that either the client or the server can indicate to the other that it is going to close the persistent connection. It does so by including the connection-token "close" in the Connection-header field of the http request/reply.
b) HTTP does not provide any encryption services.
c) (From RFC 2616) "Clients that use persistent connections should limit the number of simultaneous connections that they maintain to a given server. A single-user client SHOULD NOT maintain more than 2 connections with any server or proxy."
d) Yes. (From RFC 2616) "A client might have started to send a new request at the same time that the server has decided to close the "idle" connection. From the server's point of view, the connection is being closed while it was idle, but from the client's point of view, a request is in progress."

Problem 10

Note that each downloaded object can be completely put into one data packet. Let Tp denote the one-way propagation delay between the client and the server.

First consider parallel downloads using non-persistent connections. Parallel downloads would allow 10 connections to share the 150 bits/sec bandwidth, giving each just 15 bits/sec. Thus, the total time needed to receive all objects is given by:

$(200/150+T\mathrm{p} + 200/150 +T\mathrm{p} + 200/150+T\mathrm{p} + 100{,}000/150+ T\mathrm{p})$
$+ (200/(150/10)+T\mathrm{p} + 200/(150/10) +T\mathrm{p} + 200/(150/10)+T\mathrm{p} + 100{,}000/(150/10)+ T\mathrm{p})$
$= 7377 + 8*T\mathrm{p}$ (seconds)

Now consider a persistent HTTP connection. The total time needed is given by:

$(200/150+T\mathrm{p} + 200/150 +T\mathrm{p} + 200/150+T\mathrm{p} + 100{,}000/150+ T\mathrm{p})$
$+ 10*(200/150+T\mathrm{p} + 100{,}000/150+ T\mathrm{p})$
$=7351 + 24*T\mathrm{p}$ (seconds)

Assuming the speed of light is $300*10^6$ m/sec, then $T\mathrm{p}=10/(300*10^6)=0.03$ microsec. Tp is therefore negligible compared with transmission delay.

Thus, we see that persistent HTTP is not significantly faster (less than 1 percent) than the non-persistent case with parallel download.