Practice Problem 1) (Computer Networking: A Top-Down Approach 6th Edition: Chapter 2 P1)

a) F
b) T
c) F

Practice Problem 2) (Computer Networking: A Top-Down Approach 6th Edition: Chapter 2 P3)

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

Practice Problem 3) (Computer Networking: A Top-Down Approach 6th Edition: Chapter 2 P7)

The total amount of time to get the IP address is

$RTT_1 + RTT_2 + \ldots + RTT_n$

Once the IP address is known, RTT_o elapses to set up the TCP connection and another RTT_o elapses to request and receive the small object. The total response time is

$2RTT_o + RTT_1 + RTT_2 + \ldots + RTT_n$

Practice Problem 4) (Computer Networking: A Top-Down Approach 6th Edition: Chapter 2 P8)

a) $RTT_1 + \ldots + RTT_n + 2RTT_o + 8 * 2RTT_o = 18RTT_o + RTT_1 + \ldots + RTT_n$
.
b) $RTT_1 + \ldots + RTT_n + 2RTT_o + 2 * 2RTT_o = 6RTT_o + RTT_1 + \ldots + RTT_n$

c) $RTT_1 + \ldots + RTT_n + 2RTT_o + RTT_o = 3RTT_o + RTT_1 + \ldots + RTT_n$.

Practice Problem 5) (Computer Networking: A Top-Down Approach 6th Edition: Chapter 2 P19)

a)
dig +norecurse @a.root-servers.net any soe.ucsc.edu

```
; <<>> DiG 9.9.5-3ubuntu0.11-Ubuntu <<>> +norecurse @a.root-servers.net any soe.ucsc.edu
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 29432
;; flags: qr; QUERY: 1, ANSWER: 0, AUTHORITY: 6, ADDITIONAL: 8

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;soe.ucsc.edu.                    IN      ANY

;; AUTHORITY SECTION:
edu.                  172800  IN      NS      f.edu-servers.net.
edu.                  172800  IN      NS      a.edu-servers.net.
edu.                  172800  IN      NS      g.edu-servers.net.
edu.                  172800  IN      NS      l.edu-servers.net.
edu.                  172800  IN      NS      c.edu-servers.net.
edu.                  172800  IN      NS      d.edu-servers.net.

;; ADDITIONAL SECTION:
f.edu-servers.net.    172800  IN      A       192.35.51.30
a.edu-servers.net.    172800  IN      A       192.5.6.30
g.edu-servers.net.    172800  IN      A       192.42.93.30
g.edu-servers.net.    172800  IN      AAAA    2001:503:cc2c::2:36
l.edu-servers.net.    172800  IN      A       192.41.162.30
c.edu-servers.net.    172800  IN      A       192.26.92.30
d.edu-servers.net.    172800  IN      A       192.31.80.30

;; Query time: 14 msec
;; SERVER: 198.41.0.4#53(198.41.0.4)
;; WHEN: Tue Jan 31 17:33:27 STD 2017
;; MSG SIZE  rcvd: 276
```

dig +norecurse @f.edu-servers.net any soe.ucsc.edu

```
; <<>> DiG 9.9.5-3ubuntu0.11-Ubuntu <<>> +norecurse @f.edu-servers.net any soe.ucsc.edu
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 43032
;; flags: qr; QUERY: 1, ANSWER: 0, AUTHORITY: 5, ADDITIONAL: 5

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;soe.ucsc.edu.                     IN      ANY

;; AUTHORITY SECTION:
ucsc.edu.                172800  IN      NS      ns.zocalo.net.
ucsc.edu.                172800  IN      NS      dns.princeton.edu.
ucsc.edu.                172800  IN      NS      sns-pb.isc.org.
ucsc.edu.                172800  IN      NS      adns1.ucsc.edu.
ucsc.edu.                172800  IN      NS      adns2.ucsc.edu.

;; ADDITIONAL SECTION:
ns.zocalo.net.           172800  IN      A       157.22.0.254
dns.princeton.edu.       172800  IN      A       128.112.129.15
adns1.ucsc.edu.          172800  IN      A       128.114.100.100
adns2.ucsc.edu.          172800  IN      A       128.114.100.200

;; Query time: 6 msec
;; SERVER: 192.35.51.30#53(192.35.51.30)
;; WHEN: Tue Jan 31 17:33:32 STD 2017
;; MSG SIZE  rcvd: 228
```

dig +norecurse @ns.zocalo.net any soe.ucsc.edu

```
; <<>> DiG 9.9.5-3ubuntu0.11-Ubuntu <<>> +norecurse @ns.zocalo.net any soe.ucsc.edu
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 9780
;; flags: qr ra; QUERY: 1, ANSWER: 0, AUTHORITY: 2, ADDITIONAL: 5

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 512
;; QUESTION SECTION:
;soe.ucsc.edu.                     IN      ANY

;; AUTHORITY SECTION:
soe.ucsc.edu.            86400   IN      NS      adns1.ucsc.edu.
soe.ucsc.edu.            86400   IN      NS      adns2.ucsc.edu.

;; ADDITIONAL SECTION:
adns1.ucsc.edu.          86400   IN      A       128.114.100.100
adns1.ucsc.edu.          86400   IN      AAAA    2607:f5f0:2::100
adns2.ucsc.edu.          86400   IN      A       128.114.100.200
adns2.ucsc.edu.          86400   IN      AAAA    2607:f5f0:2::200

;; Query time: 4 msec
;; SERVER: 157.22.0.254#53(157.22.0.254)
;; WHEN: Tue Jan 31 17:33:37 STD 2017
;; MSG SIZE  rcvd: 169
```

dig +norecurse @adns1.ucsc.edu any soe.ucsc.edu

```
; <<>> DiG 9.9.5-3ubuntu0.11-Ubuntu <<>> +norecurse @adns1.ucsc.edu any soe.ucsc.edu
; (2 servers found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 1989
;; flags: qr aa; QUERY: 1, ANSWER: 12, AUTHORITY: 0, ADDITIONAL: 5

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;soe.ucsc.edu.                   IN      ANY

;; ANSWER SECTION:
SOE.UCSC.EDU.           43200   IN      NS      adns1.ucsc.edu.
SOE.UCSC.EDU.           43200   IN      NS      adns2.ucsc.edu.
SOE.UCSC.EDU.           86400   IN      A       128.114.47.25
SOE.UCSC.EDU.           86400   IN      TXT     "v=spf1 ip4:128.114.0.0/16 include:_spf.google.com ~all"
SOE.UCSC.EDU.           86400   IN      TXT     "google-site-verification=lG2KNjRqWn3Gd8CsDRQqGrNjx16D59g8rGAsYGG7_38"
SOE.UCSC.EDU.           86400   IN      TXT     "google-site-verification=aBw7mtamYHFcvot4jfhUQ5n8FlTssGwjsqW2kX-fqEE"
SOE.UCSC.EDU.           28800   IN      MX      30 alt4.aspmx.l.google.com.
SOE.UCSC.EDU.           28800   IN      MX      30 alt3.aspmx.l.google.com.
SOE.UCSC.EDU.           28800   IN      MX      20 alt2.aspmx.l.google.com.
SOE.UCSC.EDU.           28800   IN      MX      10 aspmx.l.google.com.
SOE.UCSC.EDU.           28800   IN      MX      20 alt1.aspmx.l.google.com.
SOE.UCSC.EDU.           28800   IN      SOA     hostmaster.ucsc.edu. hostmaster.soe.ucsc.edu. 2016021260 10800 3600 2419200 900

;; ADDITIONAL SECTION:
adns1.ucsc.edu.         86400   IN      A       128.114.100.100
adns2.ucsc.edu.         86400   IN      A       128.114.100.200
adns1.ucsc.edu.         86400   IN      AAAA    2607:f5f0:2::100
adns2.ucsc.edu.         86400   IN      AAAA    2607:f5f0:2::200

;; Query time: 1 msec
;; SERVER: 128.114.100.100#53(128.114.100.100)
;; WHEN: Tue Jan 31 17:33:42 STD 2017
;; MSG SIZE  rcvd: 602
```

b)
The answer for google.com could be similar as above, using the nameservers:

a.root-servers.net
E.GTLD-SERVERS.NET
ns1.google.com

Practice Problem 6) (Computer Networking: A Top-Down Approach 6th Edition: Chapter 2 P20)

We can periodically take a snapshot of the DNS caches in the local DNS servers. The Web server that appears most frequently in the DNS caches is the most popular server. This is because if more users are interested in a Web server, then DNS requests for that server are more frequently sent by users. Thus, that Web server will appear in the DNS caches more frequently.

Practice Problem 7) (Computer Networking: A Top-Down Approach 6th Edition: Chapter 2 P21)

Yes, we can use dig to query that Web site in the local DNS server. For example, "dig cnn.com" will return the query time for finding cnn.com. If cnn.com was just accessed a couple of seconds ago, an entry for cnn.com is cached in the local DNS cache, so the query time is 0 msec. Otherwise, the query time is large

Practice Problem 8) (Computer Networking: A Top-Down Approach 6th Edition: Chapter 2 P22)

Client Server

	10	100	1000
300 Kbps	7680	51200	512000
700 Kbps	7680	51200	512000
2 Mbps	7680	51200	512000

Peer to Peer

	10	100	1000
300 Kbps	7680	25904	47559
700 Kbps	7680	15616	21525
2 Mbps	7680	7680	7680

Practice Problem 9) (Computer Networking: A Top-Down Approach 6th Edition: Chapter 2 P33)

Yes, you can configure many browsers to open multiple simultaneous connections to a Web site. The advantage is that you will you potentially download the file faster. The disadvantage is that you may be hogging the bandwidth, thereby significantly slowing down the downloads of other users who are sharing the same physical links.