EE122–Fall 2013 — Solutions to Homework 3

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Problem 1

a)

```
hive7 [207] ~ # dig www.google.com

; <<>> DiG 9.8.1-P1 <<>> www.google.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 58066
;; flags: qr rd ra; QUERY: 1, ANSWER: 5, AUTHORITY: 4, ADDITIONAL: 4

;; QUESTION SECTION:
;www.google.com.                        IN      A

;; ANSWER SECTION:
www.google.com.         125     IN      A       74.125.239.113
www.google.com.         125     IN      A       74.125.239.116
www.google.com.         125     IN      A       74.125.239.115
www.google.com.         125     IN      A       74.125.239.112
www.google.com.         125     IN      A       74.125.239.114

;; AUTHORITY SECTION:
google.com.             24301   IN      NS      ns2.google.com.
google.com.             24301   IN      NS      ns1.google.com.
google.com.             24301   IN      NS      ns3.google.com.
google.com.             24301   IN      NS      ns4.google.com.

;; ADDITIONAL SECTION:
ns2.google.com.         273175  IN      A       216.239.34.10
ns3.google.com.         274065  IN      A       216.239.36.10
ns1.google.com.         274065  IN      A       216.239.32.10
ns4.google.com.         273175  IN      A       216.239.38.10

;; Query time: 1 msec
;; SERVER: 128.32.112.21#53(128.32.112.21)
;; WHEN: Sun Dec  1 11:05:02 2013
;; MSG SIZE  rcvd: 248
```

Name=www.google.com
TTL=125
Class=IN
Type=A
Value=74.125.239.113

b)

```
hive7 [208] ~ # dig @a.root-servers.net www.google.com

; <<>> DiG 9.8.1-P1 <<>> @a.root-servers.net www.google.com
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 28443
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 13, ADDITIONAL: 14
;; WARNING: recursion requested but not available

;; QUESTION SECTION:
;www.google.com.                        IN      A

;; AUTHORITY SECTION:
com.                    172800  IN      NS      m.gtld-servers.net.
com.                    172800  IN      NS      l.gtld-servers.net.
com.                    172800  IN      NS      k.gtld-servers.net.
com.                    172800  IN      NS      j.gtld-servers.net.
com.                    172800  IN      NS      i.gtld-servers.net.
com.                    172800  IN      NS      h.gtld-servers.net.
com.                    172800  IN      NS      g.gtld-servers.net.
com.                    172800  IN      NS      f.gtld-servers.net.
com.                    172800  IN      NS      e.gtld-servers.net.
com.                    172800  IN      NS      d.gtld-servers.net.
com.                    172800  IN      NS      c.gtld-servers.net.
com.                    172800  IN      NS      b.gtld-servers.net.
com.                    172800  IN      NS      a.gtld-servers.net.

;; ADDITIONAL SECTION:
m.gtld-servers.net.     172800  IN      A       192.55.83.30
l.gtld-servers.net.     172800  IN      A       192.41.162.30
k.gtld-servers.net.     172800  IN      A       192.52.178.30
j.gtld-servers.net.     172800  IN      A       192.48.79.30
i.gtld-servers.net.     172800  IN      A       192.43.172.30
h.gtld-servers.net.     172800  IN      A       192.54.112.30
g.gtld-servers.net.     172800  IN      A       192.42.93.30
f.gtld-servers.net.     172800  IN      A       192.35.51.30
e.gtld-servers.net.     172800  IN      A       192.12.94.30
d.gtld-servers.net.     172800  IN      A       192.31.80.30
c.gtld-servers.net.     172800  IN      A       192.26.92.30
b.gtld-servers.net.     172800  IN      A       192.33.14.30
b.gtld-servers.net.     172800  IN      AAAA    2001:503:231d::2:30
a.gtld-servers.net.     172800  IN      A       192.5.6.30

;; Query time: 13 msec
;; SERVER: 198.41.0.4#53(198.41.0.4)
;; WHEN: Sun Dec  1 11:30:09 2013
;; MSG SIZE  rcvd: 492
```

```
hive7 [209] ~ # dig @m.gtld-servers.net www.google.com

; <<>> DiG 9.8.1-P1 <<>> @m.gtld-servers.net www.google.com
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 24476
;; flags: qr rd; QUERY: 1, ANSWER: 0, AUTHORITY: 4, ADDITIONAL: 4
;; WARNING: recursion requested but not available

;; QUESTION SECTION:
;www.google.com.                        IN      A

;; AUTHORITY SECTION:
google.com.             172800  IN      NS      ns2.google.com.
google.com.             172800  IN      NS      ns1.google.com.
google.com.             172800  IN      NS      ns3.google.com.
google.com.             172800  IN      NS      ns4.google.com.

;; ADDITIONAL SECTION:
ns2.google.com.         172800  IN      A       216.239.34.10
ns1.google.com.         172800  IN      A       216.239.32.10
ns3.google.com.         172800  IN      A       216.239.36.10
ns4.google.com.         172800  IN      A       216.239.38.10

;; Query time: 45 msec
;; SERVER: 192.55.83.30#53(192.55.83.30)
;; WHEN: Sun Dec  1 11:31:11 2013
;; MSG SIZE  rcvd: 168
```

```
hive7 [210] ~ # dig @ns2.google.com www.google.com

; <<>> DiG 9.8.1-P1 <<>> @ns2.google.com www.google.com
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 28253
;; flags: qr aa rd; QUERY: 1, ANSWER: 5, AUTHORITY: 0, ADDITIONAL: 0
;; WARNING: recursion requested but not available

;; QUESTION SECTION:
;www.google.com.                        IN      A

;; ANSWER SECTION:
www.google.com.         300     IN      A       74.125.239.144
www.google.com.         300     IN      A       74.125.239.145
www.google.com.         300     IN      A       74.125.239.148
www.google.com.         300     IN      A       74.125.239.146
www.google.com.         300     IN      A       74.125.239.147

;; Query time: 64 msec
;; SERVER: 216.239.34.10#53(216.239.34.10)
;; WHEN: Sun Dec  1 11:31:53 2013
;; MSG SIZE  rcvd: 112
```

a.root-servers.net→n.gtld-servers.net→ns2.google.com
a.root-servers.net is responsible for *
n.gtld-servers.net is responsible for *.com
ns2.google.com is responsible for *.google.com

c)

```
hive7 [214] ~ # dig @ns1.iitkgp.ac.in www.google.com

; <<>> DiG 9.8.1-P1 <<>> @ns1.iitkgp.ac.in www.google.com
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 36638
;; flags: qr rd ra; QUERY: 1, ANSWER: 5, AUTHORITY: 4, ADDITIONAL: 1

;; QUESTION SECTION:
;www.google.com.                        IN      A

;; ANSWER SECTION:
www.google.com.         184     IN      A       74.125.236.209
www.google.com.         184     IN      A       74.125.236.212
www.google.com.         184     IN      A       74.125.236.208
www.google.com.         184     IN      A       74.125.236.211
www.google.com.         184     IN      A       74.125.236.210

;; AUTHORITY SECTION:
google.com.             166952  IN      NS      ns3.google.com.
google.com.             166952  IN      NS      ns1.google.com.
google.com.             166952  IN      NS      ns2.google.com.
google.com.             166952  IN      NS      ns4.google.com.

;; ADDITIONAL SECTION:
ns1.google.com.         16346   IN      A       216.239.32.10

;; Query time: 291 msec
;; SERVER: 203.110.245.241#53(203.110.245.241)
;; WHEN: Sun Dec  1 11:38:12 2013
;; MSG SIZE  rcvd: 200
```

```
hive7 [215] ~ # dig @ns1.fujitsu.fr www.google.com

; <<>> DiG 9.8.1-P1 <<>> @ns1.fujitsu.fr www.google.com
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 34077
;; flags: qr rd ra; QUERY: 1, ANSWER: 5, AUTHORITY: 4, ADDITIONAL: 4

;; QUESTION SECTION:
;www.google.com.                        IN      A

;; ANSWER SECTION:
www.google.com.         300     IN      A       173.194.40.176
www.google.com.         300     IN      A       173.194.40.177
www.google.com.         300     IN      A       173.194.40.178
www.google.com.         300     IN      A       173.194.40.179
www.google.com.         300     IN      A       173.194.40.180

;; AUTHORITY SECTION:
google.com.             318727  IN      NS      ns3.google.com.
google.com.             318727  IN      NS      ns4.google.com.
google.com.             318727  IN      NS      ns1.google.com.
google.com.             318727  IN      NS      ns2.google.com.

;; ADDITIONAL SECTION:
ns1.google.com.         72330   IN      A       216.239.32.10
ns2.google.com.         72330   IN      A       216.239.34.10
ns3.google.com.         72330   IN      A       216.239.36.10
ns4.google.com.         72330   IN      A       216.239.38.10

;; Query time: 189 msec
;; SERVER: 62.244.109.18#53(62.244.109.18)
;; WHEN: Sun Dec  1 11:39:14 2013
;; MSG SIZE  rcvd: 248
```

The latency that was returned by my default DNS server is much less than that returned by these two servers. Because the google server for the ip address returned by our default DNS server is much closer to us.

d)
dig www.google.com

Answers:
(no response)
Authority section:
ns1.google.com 3600 IN NS ns.evilsearch.com
Addition: ns.evilsearch.com IN A xxx.xxx.xxx.xxx

check whether the returned domain server name is a legal, or 'evil free' using a provided list such as the computer user's organization or an Internet service provider (ISP)

Problem 2

1. R+R+4*(R+R)=10R
2. R+R+4R=6R
3. R+R+R+R=4R
4. R+R+4*($\frac{1}{2}$R+$\frac{1}{2}$R)=6R
5. R+R+$\frac{1}{2}$R+4*$\frac{1}{2}$R=4.5R
6. R+R+$\frac{1}{2}$R+$\frac{1}{2}$R=3R
7. R+R+2*($\frac{3}{4}$R+$\frac{1}{2}$R+$\frac{1}{3}$R+$\frac{1}{4}$R)=$\frac{17}{3}$R
8. R+R+2*($\frac{3}{4}$R+$\frac{1}{2}$R+$\frac{1}{3}$R+$\frac{1}{4}$R)=$\frac{17}{3}$R
9. R+R+2*$\frac{3}{4}$R=3.5R

Problem 3

1. E→B
   (a) CS
      i. X=A,Y=B: Yes;No, because B is listening E's transmission, A's data blend with E's data and result in noise; Yes, because there is a noise occur.
      ii. X=F,Y=C: Yes;Yes;No Because in this case E and F are speaking, B and C are listening, no node is affected.
      iii. X=C.Y=A: Yes;Yes, because A is not listening to anyone when C decides to send data to A; Yes, because the broadcast of C blend with E's, and result in noise.
   (b) MACA
      i. X=A,Y=B: No, because A received CTS from B.
      ii. X=F,Y=C: No, because B's CTS blend with F's RTS and results in noise.
      iii. X=C.Y=A: No, because C received CTS from B.
2. B→E
   (a) CS
      i. X=A,Y=B: No, because B is speaking.
      ii. X=F,Y=C: Yes;No, because F's data blend with B's data; No, the origin transmission would not be affected.
      iii. X=C.Y=A: No, because C's data blend with B's data and results in noise to A.
   (b) MACA
      i. X=A,Y=B: No, because B could not response to A's RTS with CTS when transmitting data to E.
      ii. X=F,Y=C: No, because F's CTS blends with B's data and results in noise to B.
      iii. X=C.Y=A: No, because B's data broadcasting will results in noise to A and C.
3. A→B
   (a) CS:None
   (b) MACA:None
4. (a) CS:Yes, because D,E,F are speaking and A,B,C are listening, there is no collision.

(b) MACA:Yes, because D,E,F send RTS to A,B,C; A,B,C send CTS to neighbors; before A,B,C receive CTS from each other, their own CTS were sent out to D,E,F; then D,E,F start to transmitting data with no collision.

5. Ideal: All of these, because for an ideal scenario, all nodes can simultaneously speak and listen.
   CS: None of these, because for a node using CS, it can either speak or listen, but not both. MACA: All of these, for D→A, E→B, F→C, it is the same scenario with question 4. And for A→D, B→E, C→F, A,B,C only receive RTS but no CTS from nodes other than D,E,F correspondingly for pairs (D,A)(E,B)(F,C), so the data can be transmitted without collision.

Problem 4

1. (a) 4-1-0-2-3-5 with 0 is the root
   (b) 5-4-1-2-3 with 1 is the root

2. transmission: switches | end-hosts
   b to c: 0,1,2,3,4,5 | a,b,c,d,e,f,g
   c to b: 2,0,1 | b
   d to c: 3,5,2 | c,f
   a to b: 0,1 | b
   a to g: 0,1,2,3,4,5 | a,b,c,d,e,f,g

3. b to c: floods
   a to b: unicasts
   c to b: floods
   b to c: unicasts
   a to b: unicasts
   c to b: floods
   b to c: unicasts
   a to b: unicasts
   c to b: floods
   b to c: unicasts
   a to b: unicasts
   c to b: floods

   (a) (transmission) fraction flooded | fraction unicasted
   (a to b): $\frac{0}{4} \mid \frac{4}{4}$
   (b to c): $\frac{1}{4} \mid \frac{3}{4}$
   (c to b): $\frac{4}{4} \mid \frac{0}{4}$
   (b) swap 2,3 and swap 11,12