Exercise 2 :

Question 1 :

IP address is 150.203.161.98.
And type of DNS query is A, which means IPv4 address record.

```
wagner % dig www.cecs.anu.edu.au

; <<>> DiG 9.7.3 <<>> www.cecs.anu.edu.au
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 51677
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 3, ADDITIONAL: 3

;; QUESTION SECTION:
;www.cecs.anu.edu.au.           IN      A

;; ANSWER SECTION:
www.cecs.anu.edu.au.    1545    IN      CNAME   rproxy.cecs.anu.edu.au.
rproxy.cecs.anu.edu.au. 1545    IN      A       150.203.161.98

;; AUTHORITY SECTION:
anu.edu.au.             6113    IN      NS      ns.adelaide.edu.au.
anu.edu.au.             6113    IN      NS      una.anu.edu.au.
anu.edu.au.             6113    IN      NS      ns1.anu.edu.au.

;; ADDITIONAL SECTION:
ns.adelaide.edu.au.     11092   IN      A       129.127.40.3
ns1.anu.edu.au.         3295    IN      A       150.203.1.10
una.anu.edu.au.         16269   IN      A       150.203.22.28

;; Query time: 1 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Tue Aug 22 10:43:27 2017
;; MSG SIZE  rcvd: 184
```

Question 2:

The canonical name for the CECS ANU web server is rproxy.cecs.anu.edu.au.
The IP address is 150.203.161.98.
The reason why having an alias is canonical name is easy for human to remember. Sometimes server need to change the IP address, but alias can through the DNS server to connect to correct server if they don't know the new IP address.

Question 3:

The Authority section :
It indicates the server that are the ultimate authority for answering DNS queries about that domain.

The reason for this section is that you can query any* DNS server to answer a query for you. That server may choose though to answer the query from a cache. However, if you want to ensure you get an authoritative response ("from the horses mouth" so to speak) - you should

ask the server in the authority section.(This part is learned from stackflow.com)

Additional section:
It means: other information that is relevant to your question but not actually the answer to it. (This part is learned from serverfault.com)

Question 4:

IP address is 129.94.242.2 by using command cat /etc/resolv.conf

```
weill % cat /etc/resolv.conf
domain orchestra.cse.unsw.EDU.AU.
nameserver 129.94.242.2
nameserver 129.94.242.45
nameserver 129.94.242.33
options rotate
search orchestra.cse.unsw.EDU.AU. cse.unsw.EDU.AU. unsw.EDU.AU.
weill %
```

Question 5:

The DNS name servers for the “cecs.anu.edu.au” domain are ns1.cecs.anu.edu.au, ns2.cecs.anu.edu.au, ns4.cecs.anu.edu.au and ns3.cecs.anu.edu.au.
The IP address of ns1.cecs.anu.edu.au is 150.203.161.4.
The IP address of ns2.cecs.anu.edu.au is 150.203.161.36.
The IP address of ns3.cecs.anu.edu.au is 150.203.161.50.
The IP address of ns4.cecs.anu.edu.au is 150.203.161.38.
The type of DNS query sent to obtain this information is NS. Function is Delegates a DNS zone to use the given authoritative name servers

```
weill % dig cecs.anu.edu.au NS

; <<>> DiG 9.7.3 <<>> cecs.anu.edu.au NS
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 13325
;; flags: qr rd ra; QUERY: 1, ANSWER: 4, AUTHORITY: 0, ADDITIONAL: 8

;; QUESTION SECTION:
;cecs.anu.edu.au.               IN      NS

;; ANSWER SECTION:
cecs.anu.edu.au.        38      IN      NS      ns1.cecs.anu.edu.au.
cecs.anu.edu.au.        38      IN      NS      ns2.cecs.anu.edu.au.
cecs.anu.edu.au.        38      IN      NS      ns4.cecs.anu.edu.au.
cecs.anu.edu.au.        38      IN      NS      ns3.cecs.anu.edu.au.

;; ADDITIONAL SECTION:
ns1.cecs.anu.edu.au.    1404    IN      A       150.203.161.4
ns1.cecs.anu.edu.au.    1675    IN      AAAA    2001:388:1034:2905::4
ns2.cecs.anu.edu.au.    1886    IN      A       150.203.161.36
ns2.cecs.anu.edu.au.    1752    IN      AAAA    2001:388:1034:2905::24
ns3.cecs.anu.edu.au.    1675    IN      A       150.203.161.50
ns3.cecs.anu.edu.au.    1838    IN      AAAA    2001:388:1034:2905::32
ns4.cecs.anu.edu.au.    3552    IN      A       150.203.161.38
ns4.cecs.anu.edu.au.    3552    IN      AAAA    2001:388:1034:2905::26

;; Query time: 0 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Tue Aug 22 23:57:29 2017
;; MSG SIZE  rcvd: 281
```

Question 6:

The DNS name associated with the IP address 149.171.158.109 are engplws008.ad.unsw.edu.au and www.engineering.unsw.edu.au.
DNS query type is PTR.

```
weill % dig -x 149.171.158.109

; <<>> DiG 9.7.3 <<>> -x 149.171.158.109
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 28519
;; flags: qr rd ra; QUERY: 1, ANSWER: 2, AUTHORITY: 3, ADDITIONAL: 6

;; QUESTION SECTION:
;109.158.171.149.in-addr.arpa.  IN      PTR

;; ANSWER SECTION:
109.158.171.149.in-addr.arpa. 3600 IN   PTR     engplws008.ad.unsw.edu.au.
109.158.171.149.in-addr.arpa. 3600 IN   PTR     www.engineering.unsw.edu.au.

;; AUTHORITY SECTION:
158.171.149.in-addr.arpa. 10800 IN      NS      ns3.unsw.edu.au.
158.171.149.in-addr.arpa. 10800 IN      NS      ns1.unsw.edu.au.
158.171.149.in-addr.arpa. 10800 IN      NS      ns2.unsw.edu.au.

;; ADDITIONAL SECTION:
ns1.unsw.edu.au.        337     IN      A       129.94.0.192
ns1.unsw.edu.au.        4376    IN      AAAA    2001:388:c:35::1
ns2.unsw.edu.au.        337     IN      A       129.94.0.193
ns2.unsw.edu.au.        339     IN      AAAA    2001:388:c:35::2
ns3.unsw.edu.au.        282     IN      A       192.155.82.178
ns3.unsw.edu.au.        293     IN      AAAA    2600:3c01::f03c:91ff:fe73:5f10

;; Query time: 6 msec
;; SERVER: 129.94.242.2#53(129.94.242.2)
;; WHEN: Wed Aug 23 00:13:50 2017
```

Question 7:

No, I didn't get an authoritative answer because there are flags: qr rd ra, no aa.
QR specifies whether this message is a query (0), or a response (1)
AA Authoritative Answer
RD Recursion Desired
RA Recursion Available

```
weill % dig @129.94.242.33 yahoo.com

; <<>> DiG 9.7.3 <<>> @129.94.242.33 yahoo.com
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 30364
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 5, ADDITIONAL: 8

;; QUESTION SECTION:
;yahoo.com.                     IN      A

;; ANSWER SECTION:
yahoo.com.              857     IN      A       98.139.180.149
yahoo.com.              857     IN      A       206.190.36.45
yahoo.com.              857     IN      A       98.138.253.109

;; AUTHORITY SECTION:
yahoo.com.              31333   IN      NS      ns1.yahoo.com.
yahoo.com.              31333   IN      NS      ns5.yahoo.com.
yahoo.com.              31333   IN      NS      ns4.yahoo.com.
yahoo.com.              31333   IN      NS      ns2.yahoo.com.
yahoo.com.              31333   IN      NS      ns3.yahoo.com.

;; ADDITIONAL SECTION:
ns1.yahoo.com.          37773   IN      A       68.180.131.16
ns1.yahoo.com.          33031   IN      AAAA    2001:4998:130::1001
ns2.yahoo.com.          138805  IN      A       68.142.255.16
ns2.yahoo.com.          33030   IN      AAAA    2001:4998:140::1002
ns3.yahoo.com.          212112  IN      A       203.84.221.53
ns3.yahoo.com.          33077   IN      AAAA    2406:8600:b8:fe03::1003
ns4.yahoo.com.          206834  IN      A       98.138.11.157
ns5.yahoo.com.          202910  IN      A       119.160.247.124
```

Question 8:

By using 129.94.242.3 to test, It shows connection timed out..

```
weill % dig @129.94.242.3 yahoo.com

; <<>> DiG 9.7.3 <<>> @129.94.242.3 yahoo.com
; (1 server found)
;; global options: +cmd
;; connection timed out; no servers could be reached
```

Question 9:

The type is MX

```
weill % dig @ns1.yahoo.com yahoo.com MX

; <<>> DiG 9.7.3 <<>> @ns1.yahoo.com yahoo.com MX
; (1 server found)
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 3635
;; flags: qr aa rd; QUERY: 1, ANSWER: 3, AUTHORITY: 5, ADDITIONAL: 8
;; WARNING: recursion requested but not available

;; QUESTION SECTION:
;yahoo.com.                     IN      MX

;; ANSWER SECTION:
yahoo.com.              1800    IN      MX      1 mta6.am0.yahoodns.net.
yahoo.com.              1800    IN      MX      1 mta5.am0.yahoodns.net.
yahoo.com.              1800    IN      MX      1 mta7.am0.yahoodns.net.

;; AUTHORITY SECTION:
yahoo.com.              172800  IN      NS      ns2.yahoo.com.
yahoo.com.              172800  IN      NS      ns1.yahoo.com.
yahoo.com.              172800  IN      NS      ns4.yahoo.com.
yahoo.com.              172800  IN      NS      ns5.yahoo.com.
yahoo.com.              172800  IN      NS      ns3.yahoo.com.

;; ADDITIONAL SECTION:
ns1.yahoo.com.          1209600 IN      A       68.180.131.16
ns2.yahoo.com.          1209600 IN      A       68.142.255.16
ns3.yahoo.com.          1209600 IN      A       203.84.221.53
ns4.yahoo.com.          1209600 IN      A       98.138.11.157
ns5.yahoo.com.          1209600 IN      A       119.160.247.124
ns1.yahoo.com.          86400   IN      AAAA    2001:4998:130::1001
ns2.yahoo.com.          86400   IN      AAAA    2001:4998:140::1002
ns3.yahoo.com.          86400   IN      AAAA    2406:8600:b8:fe03::1003

;; Query time: 146 msec
;; SERVER: 68.180.131.16#53(68.180.131.16)
;; WHEN: Wed Aug 23 00:38:48 2017
;; MSG SIZE  rcvd: 360
```

Question 10:

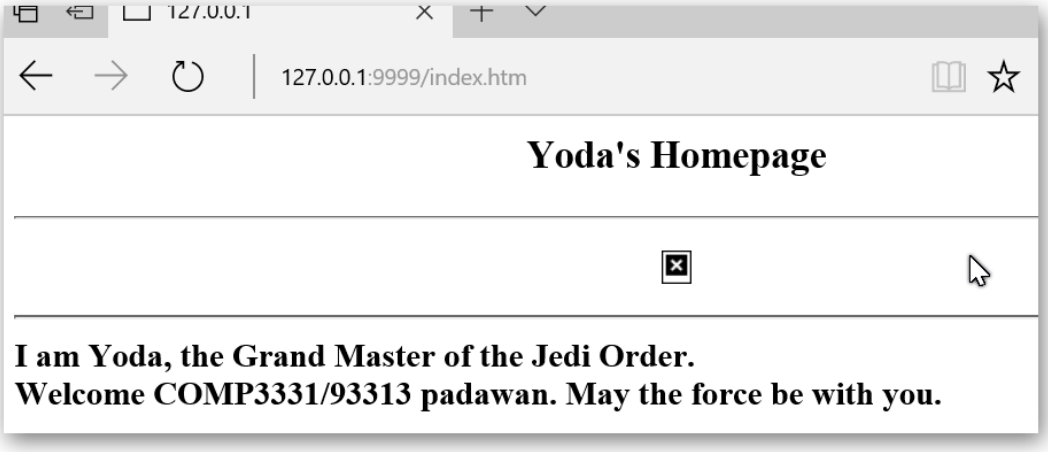
Need **6** DNS servers to query to get the authoritative answer.

Question 11:

Sure, it can own name and alias. It can also link several IP address to one physical machine.

Exercise 3 :

port is 9999



code :

```python
#coding:utf-8
from socket import *

host = '127.0.0.1'
port =  9999
address = (host, port)
serverSocket = socket(AF_INET, SOCK_STREAM)
serverSocket.bind(address)
serverSocket.listen(1)

while True:
    try:
        connectionSocket, clientAddr = serverSocket.accept()
        message = connectionSocket.recv(1024)
        filename = message.split()[1]
        f = open(filename[1:].decode('ascii'))
        outputdata = f.readlines()
        connectionSocket.send('HTTP/1.1 200 OK\r\n\r\n'.encode('ascii'))
        for i in range(0, len(outputdata)):
            connectionSocket.send(outputdata[i].encode('ascii'))
        connectionSocket.close()
    except IOError:
        connectionSocket.send("404 not found".encode('ascii'))
        connectionSocket.close()
serverSocket.close()
```