University of Pretoria
SEMESTER TEST: 27 MARCH 2018

COURSE: Computer Science

PAPER: COS332

TIME: 1 hour

MARKS: 50

EXAMINER: Prof MS Olivier

THIS PAPER CONSISTS OF 9 PAGES.

ANSWER ALL QUESTIONS.

NO CALCULATORS PERMITTED

Question 1

In each case select the alternative that fits the question best and write only the corresponding letter on your answer sheet.

a) The HTTP header contains a `Host` field in order to support

   Security.

   Virtual hosting.

   HTML.

   Authentication.

   Access speed.

b) Which of the following is a (are) valid HTTP request(s)?

```
GET / HTTP/1.0
Host:   www.up.ac.za
get / http/1.0          ✗
Host:   www.up.ac.za
GET / HTTP.1/0          ✗
Host:   www.up.ac.za
GET / HTML/1.0          ✓
Host:   www.up.ac.za
```

   E: More than one of the above

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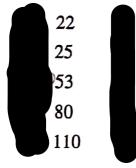c) To use POP3 anonymously, one uses the command

USER ANON

USER ANONYMOUS

NOUSER

USER *

None of the above

d) DNS normally uses the following port:

22

25

53

80

110

e) Consider the problem of *transparency* in SMTP. Which of the following is true?

Transparency is not an issue — any type of data can be e-mailed.

In most e-mail programs users should avoid typing a full stop on a line of its own, because that will prematurely terminate the body of the message and cause only the part prior to the full stop to be sent.

POP3 solves the SMTP transparency problem.

IMAP solves the SMTP transparency problem.

None of the above

f) In order to register a subdomain within a second-level domain in the .za ccTLD one has to:

Be a South African citizen.

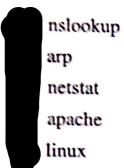Have a South African residential address.

At least have a South African spouse.
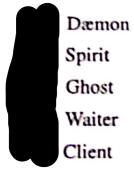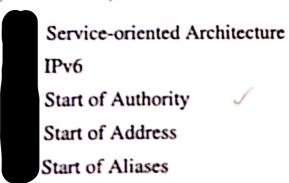
More than one of the above

None of the above

3./...

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g) ...is a simple application that will resolve domain names.

- nslookup ✓
- arp
- netstat
- apache
- linux

h) The software providing services on the internet is often known as a

- Dæmon ✓
- Spirit
- Ghost
- Waiter
- Client

i) In the DNS, SOA refers to

- Service-oriented Architecture
- IPv6
- Start of Authority ✓
- Start of Address
- Start of Aliases

j) Root name servers in the DNS perform ... name resolution.

- Iterative
- Recursive
- Non-authoritative
- All of the above
- None of the above ✓

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k) A *zone transfer* refers to the process of

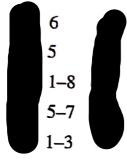Moving hosting from one service provider to another.

Selling a domain name to someone else.

Copying DNS entries from a primary server to a secondary server.

Accessing data outside the corporate network, or data in the demilitarised zone of the corporate network.

Obtaining new name servers.

l) On which ISO OSI layer(s) does the World Wide Web fit?

6

5

1–8

5–7

1–3

m) The OSI ISO presentation layer is positioned (exactly) between the ... and ... layers.

Network, Application

Transport, Application

Network, Presentation

Transport, Session

Session, Application

n) Layers 1 to 4 of the ISO OSI model are known as the

Network-oriented layers

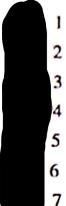Application-oriented layers

TCP/IP-oriented layers

More than one of the above

None of the above

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o) Which ISO OSI layer's functionality can be informally described as being a 'pipe'?

1
2
3
4
5
6
7

p) At which ISO/OSI layer are communicating applications synchronised?

3
4
5
6

q) When a message moves through the protocol stack towards the physical layer, headers are

Appended
Removed
Added
Modified
Rearranged

r) The ISO OSI session layer is positioned (exactly) between the ... and ... layers.

Network, Application
Transport, Application
Network, Presentation
Transport, Presentation
Presentation, Application

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s) If a group of people want to establish a new DNS top-level domain, who will approve or deny such a proposal?

Jon Postel

ICANN

IETF

ISO

The president of the USA

t) The za ccTLD is controlled by

AfriNIC

ZADNA

.za

Uniforum

.co.za

u) The nslookup command that changes the server used for name resolution is

server

host

root

resolve

use

v) A zone file with serial number 2001102002, according to convention, was probably created on

1 October 2002

20 October 2001

20 January 2016

20 October 2002

20 January 1910

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w) If the International Standards Organisation (ISO) adopts a standard

All member countries *have* to comply with the standard, but the rest of the world do not have to.

All countries in the world *have* to comply with the standard.

Almost all countries in the world enforce compliance with almost ISO standards, even though they don't have to.

ISO standards are irrelevant because nobody implements them.

None of the above

x) Assume you are writing a server that is intended to be accessed by a Telnet client.

Normally the server should echo every character received, because the client may not be able to echo typed characters locally.
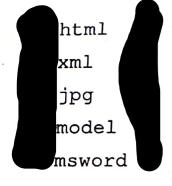
The server should not echo received input because echoing will cause characters to be displayed twice on modern Telnet clients.

The server should query the Telnet client to determine whether it echoes locally; the server should then only echo if the client will not echo.

The server should issue an ANSI escape sequence to disable local echoing at the client; the server should then echo everything received.

A good compromise is to echo every second character received; the user should be still be able to determine the intended output even if some characters are missing and others are repeated.

y) Which of the following is a valid MIME type?

html
xml
jpg
model
msword

[25]

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Question 2

Provide an example of an Internet protocol that provides the functionality described below. Each answer should consist of a single acronym or protocol number.

a) A simple network management protocol.

b) A protocol used to list and retrieve emails from an email server.

c) A protocol used to retrieve information about users of a system.

d) A very simple protocol used to retrieve files via the network — typically to load an operating system.

e) A protocol that implements a public key infrastructure for encryption purposes.   **[5]**

Question 3

The various UTF encoding schemes work by arranging the Unicode character set into a sequence where frequently used characters are associated with small numbers and less frequently used characters with larger numbers. These 'sequence' numbers are mapped to the 'real' Unicode representation.

Consider the following (hexadecimal) sequence of characters represented in UTF-8:

46 33 EA A7 98 20

a) How many Unicode characters occur in this sequence?   (1)

b) What are the UTF-8 'sequence' numbers of each of these characters? Write each sequence number on a new line. Write each of the numbers in hexadecimal.   (5)

c) Assume you encounter the following sequence of bytes in what should be a string in UTF-8: 46 A7 20 Explain why this cannot be correct.   (2)

d) UTF-8 is self-synchronising. How will this feature of UTF-8 correct the incorrect sequence of bytes in question c? Answer this question by providing the corrected sequence of bytes.   (2)

[10]

9./...

Question 4

Assume that computers on an internet are addressed using addresses (A records) consisting of numbers from 1 to 100. Assume node 1 is a root name server and you use node 100 to perform *recursive* name resolution. The following are (partial) zone files at some nodes running *iterative* DNS servers. The files are incomplete since some rows and columns have been omitted; these omissions do not affect the answers to the questions. No caching occurs.

Node 1		
com.	NS	10
org.	NS	11
mil.	NS	12
za.	NS	13

Node 13		
ac	NS	20
org	NS	21
co	NS	22
net	NS	23

Node 21		
xx	NS	66
yy	NS	55
zz	NS	44

Node 22		
xx	NS	77
yy	NS	88
zz	NS	99

Node 55		
@	NS	55
www	A	50
ftp	A	51
mail	A	52
arthur	A	53

Node 66		
@	NS	66
@	MX,1	98
www	A	60
ftp	A	61
mail	A	62
arthur	A	63

Node 77		
@	NS	77
@	MX,1	99
www	A	75
ftp	A	82
mail	A	91
arthur	A	70
john	NS	99

The following series of `nslookup` queries is executed in sequence from top to bottom. Provide the address (that is, number) returned by each of the queries. The queries are indicated by a Roman number in square brackets (such as "[iii]"). The commands that do not return responses are not numbered. Write N/A if the query cannot be resolved using the information provided below.

```
nslookup
> www.xx.org.za          [i]
> arthur.xx.co.za        [ii]
> set type=NS
> com.                   [iii]
> co.za                  [iv]
> set type=A
> ftp.xx.co.za           [v]
> server 100
> set type=MX
```

```
> ftp.xx.co.za           [vi]
> john.xx.org.za         [vii]
> set type=A
> john.xx.org.za         [viii]
> server 1
> com.                   [ix]
> server 77
> www.xx.org.za          [x]
>                        [10]
```

TOTAL   [50]

END OF PAPER