UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2018 – 3rd Year Examination – Semester 6

IT6205 - Systems and Network Administration

Structured Question Paper

06th October 2018

(TWO HOURS)

To be completed by the candidate

BIT Examination Index No: .....

Important Instructions:

- The duration of the paper is **02 (Two) hours**.
- The medium of instruction and questions is **English**.
- This paper has **04 questions** and **12 pages**.
- Answer **ALL** questions. All questions carry equal marks.
- Write your answers in English using the space provided in this question paper.
- Do not tear off any part of this answer book.
- Under no circumstances may this book, used or unused, be removed from the Examination Hall by a candidate.
- Note that questions appear on both sides of the paper. If a page is not printed, please inform the supervisor immediately.
- **Calculators are NOT allowed.**

Questions Answered

Indicate by a cross (×), the numbers of the questions answered.

	Question Numbers				Total
	1	**2**	**3**	**4**	
To be completed by the examiners:					

1) (a) Write down four (4) essential duties of a typical systems administrator.

(4 marks)

ANSWER IN THIS BOX

Following essential duties can be performed:

- **Account provisioning**
- **Perform backups**
- **Monitor the system**
- **Adding and removing hardware**
- **Installing upgrading software**
- **(Any other acceptable answer.)**

(b) Answer the following with regard to Linux.

(i) What is the main difference between Linux and GNU (GNU's not UNIX)?
(ii) Write down three (3) other open source operating systems that are similar to Linux operating system.

(2 X 3 marks)

ANSWER IN THIS BOX

(i) Linux is the kernel of a GNU/Linux operating system, it does not include all the other software needed to create an operating system. Linux is normally used in combination with the GNU operating system: the whole system is basically GNU with Linux added, or GNU/Linux. All the so-called "Linux" distributions are really distributions of GNU/Linux.

(ii) FreeBSD

NetBSD

OpenSolaris and similar

(c) Manual pages or man pages provide on-line documentation in a Unix/Linux system. Write down two (2) examples of information that will **not** be available in typical man pages.

(2 marks)

ANSWER IN THIS BOX

How to install a new device

Why the system is so slow

(Any other acceptable answer.)

(d) Most file system implementations define several types of files.

(i) Briefly explain what is meant by "named pipes". Also explain how they can be created and removed.

(4 marks)

(ii) What is the outcome of the following UNIX/Linux command executed by a user called Saman (with user name saman) who is in the */etc/sudoers* list?

```
$ sudo ln –s $HOME/web    /var/www/htdocs
```

(3 marks)

ANSWER IN THIS BOX

(i) Named pipes allow communication between two processes running on the same host. They are also known as FIFO. Named pipes can be created with the mknod command and remove them with rm command.

(ii) A symbolic link will be created by the above command and it links /var/www/htdocs directory to /home/saman/web directory.

(e) Bootstrapping is the standard term for starting up a computer. Write down three (3) distinct phases of a typical bootstrapping process.

(3 marks)

ANSWER IN THIS BOX

Phases are:

- **Reading of boot loader from the master boot record**
- **Loading and initialization of the Kernel**
- **Device detection and configuration**
- **Creation of Kernel processes**
- **Execution of system start-up scripts**

(f) What is meant by Request for Comments (RFC) documents in the Internet? Also describe how they differ from blogs available on the Internet.

(3 marks)

ANSWER IN THIS BOX

RFC document series describes the protocols and procedures used on the Internet. Most of these documents are relatively detailed and technical and assigned with a serial number.

They are absolutely authoritative and useful and the contents of an RFC never changes. Updates are distributed as new FRC with their own reference numbers.

Hence, RFCs cannot be compared to Internet blogs and none of those features are not available.

2) (a) Traditional systems use the root account for system administration. However, current systems use sudo add-on tool for such tasks. Write down four (4) advantages one can gain by using sudo.

(4 marks)

ANSWER IN THIS BOX

- **Accountability is improved because of command logging**
- **The real root password is known to one sysadmin**
- **Privileges can be revoked very easily**
- **Less chance of a root shell being left unattended**
- **A single file be used to control access and entire network.**
- **(Any other acceptable answer.)**

(b) When a new user is added to a UNIX/Linux system, it will assign a user name and a user identification number (UID). How are the above identifiers used in the system?

(2 marks)

ANSWER IN THIS BOX

The UID identifies the user to the system. Login names are provided for the convenience of users of the system, but software and the filesystem use UIDs internally. UID are usually unsigned 32 bit integers.

(c) RPM (or rpm) is a package management system in a Linux system.

(i) Write down the rpm command required to list all the packages installed on a system.

(2 marks)

(ii) What is the main difference between a package management tool like rpm and a meta-package management tool like yum?

(3 marks)

ANSWER IN THIS BOX

(i) $ rpm –qa

(ii) A meta-package management tool like yum is easy

- **To simplify the task of locating and downloading packages**
- **To automate the processes of updating or upgrading systems**
- **To facilitate the management of inter-package dependencies**

(d)

(i) Write down the Linux command to set the setuid bit of a file called Mybackup.

(ii) Briefly explain the usage of the setuid bit.

(2 x 2 marks)

ANSWER IN THIS BOX

(i) $chmod u+s Mybackup

(ii) Setuid allow users to run an executable with the permissions of the executable's owner and to change behavior in directories. They are often used to allow users on a computer system to run programs with temporarily elevated privileges in order to perform a specific task. While the assumed user id privileges provided are not always elevated, at a minimum they are specific.

(e) A redundant array of inexpensive disks (RAID) combine multiple storage devices into one virtualized device.

(i) What are the main two (2) types of operations in a RAID system?

(2 marks)

(ii) In order to implement RAID 1+0 configuration, what is the minimum number of disks required?

(2 marks)

(iii) Is there any special condition to be satisfied by the disks in order to implement the configuration stated in (e) (ii)? Justify your answer.

(3 marks)

ANSWER IN THIS BOX

(i) Performance – by stripping data across multiple drives

Redundancy – replicate data across multiple drives

(ii) Minimum 4 disks are required

(iii) With RAID-1+0, first take hard drives and match them up into mirrored pairs. Therefore, you need an even number of drives. Each hard drive has its own identical twin. On top of that, every mirrored pair gets striped together. So, every individual hard drive in the array is actually two twinned drives.

(f) Assume that a process with a PID of 5015 is started with a priority value (nice value) of five. Write down the Linux command to change the above priority value of the process to ten.

(3 marks)

ANSWER IN THIS BOX

$ renice -10 5015

3) (a) Write down the UNIX/Linux command to add a route to the 192.248.16.0/24 network through the gateway router 192.168.10.3 on interface eth1.

(3 marks)

ANSWER IN THIS BOX

 # route add –net 192.248.16.0/24 gw 192.168.10.3 eth1

(b) Answer the following with regard to basic shell commands.

(i) How does the shell treat strings enclosed in single and double quotes in Linux? Explain your answer with regard to output of the two examples below. Assume that the variable USER has assigned the string called "Amal".

```
$ echo 'Hello User $USER'

$ echo "Hello User $USER"
```

(3 marks)

(ii) What will be the outcome of the following command, when the file myCV exists in the current directory?

```
$ cat ./myCV > output 2>&1
```

(3 marks)

(iii) Complete the below Bash shell script which was written to backup all text files with extension txt in the current directory. Also note that all backed up files should have their original file name with the word backup followed by year, month and day. Write down the missing commands in **Statement-1**and **Statement-2** in the answer box.

```
#!/bin/bash
dstfile="backup-`date +%Y%m%d`"
for file in Statemet-1; do
    echo "backing up files"
    Statement-2
done
```

(4 marks)

ANSWER IN THIS BOX

(i) The first and the second commands output are:

Hello User $USER

Hello User Amal

(ii) When myCV exists it will copy the contents in the myCV file to the file called output without any message written on the terminal.

Continued …

(iii) Statement-1: *.txt

Statement-2: cp $file $file.$dstfile

(c) The following questions are based on Domain Name Server (DNS) concepts.

(i) What is meant by a zone in DNS?

(2 marks)

(ii) You have been asked to add the following information as resource records to a DNS database for a domain called bit.lk. Write the resource record for a host called "kelani" with the domain name "kelani.bit.lk" and have it resolved to the IP address 198.248.22.100.

(3 marks)

(iii) Write down the basic configuration of the "named.conf" file for a recursive primary DNS server for a domain called bit.lk.
Hint: Resource record path: /var/named/cache, Hint file name: named.hints, Primary resource record file name: bit.lk.zone

(7 marks)

ANSWER IN THIS BOX

(i) A DNS zone refers to a certain portion or administrative space within the global Domain Name System. Each DNS zone represents a boundary of authority subject to management by certain entities and is administered as a single separate entity. The total of all DNS zones form the DNS namespace.

Continued …

(ii) **kelani.bit.lk. IN A 198.248.22.100**

(iii) **named.conf file for the domain bit.lk is as follows.**

```
options {
        directory "/var/named/cache";
        recursion yes;
};

zone "."  IN {
        type hint;
        file "root.hints";
};

zone “bit.lk" IN {
        type master;
        file "bit.lk.zone";
};
```

4) (a) The following questions are based on the Apache server configuration.

(i) Write down the commands required to configure an apache server to wait 10 seconds for a subsequent request before closing a persistent connection. Also set the maximum number of request to be entertained during the persistent connections to 50.

(3 marks)

(ii) Write down the Apache configuration file which serves **bit.lk** and **old.bit.lk** with the following details. IP address of the hosting server is 192.248.22.100.
Locations of the site contents: /www/bit/web/ and /www/bit/old/, Location of access logs: /www/bit/log/, Location of error logs: /www/bit/error/, 404 Error message: error.html, Admin email: webmaster@bit.lk.

(9 marks)

ANSWER IN THIS BOX

(i) Multiple http requests can be made my using the KeepAlive directive.

```
KeepAlive  On
MaxKeepAliveRequests 50
KeepAliveTimeout 10
```

(ii)

```
NameVirtualHost 192.248.22.100
ServerAdmin webmaster@bit.lk
ErrorLog /www/bit/error/
TransferLog /www/bit/log/
ErrorDocument 404 error.html
<VirtualHost 192.248.22.100>
        ServerName bit.lk
        DocumentRoot /www/bit/web/
</VirtualHost>
<VirtualHost 192.248.22.100>
        ServerName old.bit.lk
        DocumentRoot /www/bit/old/
</VirtualHost>
```

(b) Consider the following UNIX/Linux commands.

(i) What is the outcome of the command below?

```
find /var/log –type f –size +1M –print
```

(4 marks)

(ii) What is the outcome of the following cron entry?

```
12      10      1-7      10,12      *      /etc/backup.sh
```

(4 marks)

ANSWER IN THIS BOX

(i) It will display all files that are more than 1 megabyte in size in the /var/log directory.

(ii) It will execute the backup.sh script at the /etc directory on first 7 days (1st to 7th days) for the month of October and December at 10:12 am.

(c) What is meant by Kernel-based virtual machine (KVM)? Briefly explain special requirements for KVMs, if any.

(5 marks)

ANSWER IN THIS BOX

KVM – Kernel based virtual machine is a full virtualization tool that has been included in the mainline Linux kernel.

However, it depends on the CPU (Intel VT or AMD V) virtualization extensions.

Since KVM virtualization is supported by the CPU hardware, many guest operating systems are supported.

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