UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2014/2015 – 3rd Year Examination – Semester 6

IT6204 - Systems and Network Administration

Structured Question Paper

17th July, 2015

(TWO HOURS)

To be completed by the candidate

BIT Examination Index No: .....

Important Instructions:

- The duration of the paper is **2 (Two) hours**.
- The medium of instruction and questions is English.
- This paper has **4 questions** and **10 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				
To be completed by the candidate by marking a cross (×).	1	2	3	4	**Total**
To be completed by the examiners:					

1) (a) Assume that a system administrator gets a new application software to install. Write down four (4) activities the system administrator should perform before installing it.

(4 marks)

ANSWER IN THIS BOX

Following Activities can be performed:

- **Test its functionality under the current operating system.**
- **Test its functionality under the current hardware.**
- **Users must be informed of its availability**
- **Apply patches and security updates before commissioning**
- **(Any other acceptable answer.)**

(b) Linux is a free Unix-type operating system originally created by ***Linus Torvalds*** with the assistance of developers around the world.

(i) What is the common component in the different types of Linux **distributions**?

(3 marks)

(ii) Write down three (3) popular Linux distributions.

(3 marks)

ANSWER IN THIS BOX

(i) All Linux distributions share the SAME kernel lineage, but the ancillary material that go along with that kernel can vary.

(ii) Examples of Linux Distributions (any three)

- **CentOS**
- **Ubuntu**
- **Fedora**
- **Debian**
- **RedHat**

(c) Briefly describe what is meant by manual pages (or man pages) in UNIX/Linux.

(4 marks)

ANSWER IN THIS BOX

Manual pages or man pages provide on-line documentation in a UNIX/Linux system. Man pages are concise descriptions of individual commands, drives, file formats or library routines. The man pages are divided into several sections.

(d) Answer the following with regard to file types of a UNIX/Linux system.

(i) Write down three (3) File Types found in UNIX/Linux?

(ii) Write down a UNIX/Linux command to show the type of a file?

(5 marks)

ANSWER IN THIS BOX

(i) Any three from this list:

- **Regular, Directory, Character Device, Block Device, Named Pipes, Symbolic Links & Sockets**

(ii) "stat" command or the "ls -l" command or similar command

(e) Answer the following questions with regard to shutting down a UNIX/Linux system.

(i) What is the outcome of the following UNIX/Linux command?

```
# shutdown –h +10 "For System Upgrade"
```

(ii) Write down the usage of the **shutdown** command to reboot a system.

(6 marks)

ANSWER IN THIS BOX

(i) This will shut down the system in 10 minutes from the time it is executed and display the message "For System Upgrade" in the user terminals.

(ii) # shutdown –r

2) (a)

(i) Traditional **`root`** account is the most privileged account in a UNIX system. Also it is not recommended to login directly to the root account. Briefly explain, the recommended way to access the root account without directly login to that account.

(ii) A UNIX/Linux system consults **`/etc/passwd`** file at login time to determine certain information regarding the user. Write down three (3) such types of information that are stored in the above file.

(6 marks)

ANSWER IN THIS BOX

(i) A better way to access the root account is to use "su" command. Root privileges remain in effect until you terminate the shell. Similarly "sudo" command also can be used.

(ii) Any three (3) out of these:

- **Login name**
- **Encrypted password**
- **UID/GID number**
- **Home directory or Login Shell**

(b)

(i) A storage device can be a hard disk, Flash drive or a RAID system. What is a RAID system?

(ii) What is the main difference between **RAID Level 0** and **RAID Level 1**?

(5 marks)

ANSWER IN THIS BOX

(i) A RAID (Redundant Array of Inexpensive/Independent Disks) combines multiple storage devices into one virtualized device, depending on how one sets up the array that can increase the performance and/or reliability of the system.

(ii) RAID Level 0 stripes data alternatively among the disks to increase the performance.

RAID Level 1 disk writes are duplicated to two or more drives simultaneously, which is called mirroring.

(c) Following is a line in the output of "***ls –l***" command executed on "***/home/amal***" directory.

```
-rwxr-xr-x 2 amal amal 563 Jul 17 8:20 salary.txt
```

(i) Write down the UNIX/Linux command to change the current permission of the file to allow only the owner and the group of the file to read and execute it.

(ii) What is the meaning of number **2** in the second column of the above output line?

(iii) Write down the UNIX/Linux command to change the ownership of the above file by Amal to the user Kamal with the user name kamal98.

(iv) Write down the UNIX/Linux command to set the default permission of a newly created file to have **read** and **write** permission **ONLY** to the **user** of the file.

(8 marks)

ANSWER IN THIS BOX

(i) chmod 550 salary.txt or chmod ug+rx salary.txt

(ii) It represents that there are two files representing the same data.

(iii) chown kamal98 salary.txt

(iv) umask 066 or umask 0066

(d)

(i) When a system boots, the kernel autonomously creates and installs several processes. What are the processes start by **`init`**?

(ii) What is the effect of the following command?

```
$ kill -9 1234
```

(**6 marks**)

ANSWER IN THIS BOX

(i) The "init" process is responsible for executing the system's startup scripts and the role of process management.

(ii) It will terminate (or kill) the process with process id (pid) 1234 with the signal 9.

3) (a) Write down the basic steps that one needs to configure a machine to act as a DNS client for a server with IP address 192.1.1.2 and a secondary server with IP address 8.8.8.8.

(5 marks)

ANSWER IN THIS BOX

- **First open the "/etc/resolv.conf" file.**
- **Open the above file and add the following two entries:**
  - **nameserver 192.1.1.2**
  - **nameserver 8.8.8.8**

(b) The following questions are based on the domain name server (DNS) concepts.

(i) The Start of Authority (SOA) record marks the beginning of a zone. Write down four (4) items that exists in a SOA record.

(ii) What is meant by a "Glue Record"?

(iii) Write down the basic configuration of a "`named.conf`" file for a recursive caching server.

(10 marks)

ANSWER IN THIS BOX

(i) Any of the following four items:

Name of the Zone, Primary Name Server, Technical Contact, Various timing parameters, Serial Number

(ii) A glue record is the IP address of a name server held at the domain name registry. Glue records are required when you wish to set the name servers of a domain name to a hostname under the domain name itself.

(iii) named.conf file should contain the following:

```
options {       recursion yes;
                directory "/var/named";
};
zone "." IN {
                type hint;
                file "named.ca";
};
```

Continued …

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

(i) What are the steps one needs to perform after making some changes to the Apache httpd.conf file?

(ii) Consider the following directives and briefly explain their functionality.

```
LogFormat  "%h"  newlog
CustomLog  logs/access.log  newlog
```

(iii) What do the following directives define? Provide an example of their usage.

(a) `ServerRoot` (b) `DocumentRoot`

(10 marks)

ANSWER IN THIS BOX

(i) It needs to reload/restart the apache server in order to initiate the new changes done.

(ii) The access.log file uses custom design "newlog" format and it will be recording only the IP address of the request.

(iii) ServerRoot - The top of the directory tree under which the server's configuration, error and log files are kept.

e.g. ServerRoot "/etc/httpd" ⇐ (some directory path)

DocumentRoot – This the directory which contains most of the HTML files which are served in response to requests.

e.g. DocumentRoot /var/www/html ⇐ (some directory path)

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

(i) What is the role of the Cache-Control response headers?

(ii) What is the outcome of the following access control lists and related configurations?

```
acl Lab  SRC  192.168.1.0/24
acl List dstdomain "/etc/deny-list"
http_access deny List
http_access allow Lab
http_access deny All
```

(iii) Using a suitable example, explain how Squid handles the "**OR**" and the "**AND**" operations in squid access rules. **(9 marks)**

ANSWER IN THIS BOX

(i) **They allow Web publishers to define how pages should be handled by caches. They include directives to declare what should be cacheable, what may be stored by caches, modifications of the expiration mechanism and revalidation and reload controls.**

(ii) **This will block all IPs included in "List" definition and allow access only to "Lab" IPs other than the ones that were blocked by the previous line. System admin can add the list of IPs he/she wishes to block, in the file located at "/etc/deny-list", with one IP per line.**

(iii) **Imagine an access rule which says as follows:**

http_access allow A B C D

This means that all of A, B, C and D must be true for access to be allowed.

To create OR access rules, list each access rule sequentially as in:

http_access allow A

http_access allow B

now, if either A or B are true, access is allowed

(b) Answer the following with regard to shell scripting.

(i) Assume that the System Administrator has written a script named **`backup.sh`** and when he tried to execute, it produces the error below.
`bash: ./backup.sh: Permission denied`
What action(s) is/are required to rectify the above situation?

(ii) Write a Bash shell script to copy all the files ending with ***.conf*** in the current directory with ***.conf-backup*** extension.

(iii) Briefly explain how command-line arguments are used in Bash scripting.

(6 marks)

ANSWER IN THIS BOX

(i) **The backup.sh should have the execution bit set in order to execute it. The error be rectified by issuing the command below.**

```
$ chmod u+x backup.sh
```

(ii)

```
# /bin/bash
for Files in *.conf; do
    cp $File $File-backup;
done
```

(iii) **Command-line arguments to a script become variables whose names are numbers. $1 is the first argument , $2 the second, and so on. $0 is the name by which the script was invoked.**

(c) Routine tasks can be scheduled using the **cron** utility in UNIX/Linux.

(i) What is the outcome of the following **cron** entry?

```
10    05    1-7    1,6    *    /etc/myscript.sh
```

(ii) How can a normal user of the Linux system add a new cron entry?

(5 marks)

ANSWER IN THIS BOX

(i) It will execute the /etc/myscript on first 7 days of each of the months January and June at 5:10PM.

(ii) With the command

$ crontab -e

(d)

(i) What is the role of a hypervisor in the context of full virtualization?

(ii) What is the role of a hypervisor in the context of Operating System level (OS-level) virtualization?

(5 marks)

ANSWER IN THIS BOX

(i) A hypervisor (also called as virtual machine monitor) is installed between the virtual machines and the hardware. The hypervisor provides an emulation layer for all the host's hardware devices. The guest OS is not modified and they can make direct requests to the virtualized hardware in full virtualization mode.

(ii) OS-level virtualization is very different to full virtualization. OS-level virtualization lets an operating system create multiple, isolated application environments that reference the same kernel. OS-level virtualization is a feature of the kernel rather than a separate layer as hypervisor.

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