



**UNIVERSITY OF COLOMBO, SRI LANKA**



**UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING**  
**DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)**



***Academic Year 2013/2014 – 3<sup>rd</sup> Year Examination – Semester 6***

***IT6204 - Systems and Network Administration***

***Structured Question Paper***

***01<sup>st</sup> August, 2014***

***(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.
- **Non-programmable Calculators may be used.**

**Questions Answered**

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

	Question Numbers				Total
	1	2	3	4	
<b>To be completed by the candidate by marking a cross (×).</b>					
To be completed by the examiners:					

- 1) (a) User account provisioning is one of an essential duties that the system administrators are expected to perform. Write down four (4) activities which a system administrator should perform under user account provisioning.

(4 marks)

**ANSWER IN THIS BOX**

Activities performed under user account provisioning are

- Adding new accounts,
- Removing existing accounts,
- Resetting forgotten passwords,
- Disabling user accounts when such user no longer has access to the system.

- (b) Linux is a reimplementations and elaboration of the UNIX kernel and it conforms to the POSIX standard.

- (i) What is meant by the POSIX standard?
- (ii) What is the main component that is common among different Linux distributions?

(6 marks)

**ANSWER IN THIS BOX**

- (i) POSIX means that it runs on several hardware platforms and it is compatible with most existing UNIX software.

POSIX stands for "Portable Operating System Interface".

- (ii) All Linux distributions share the same Kernel lineage, but the ancillary materials that go along with that Kernel can vary quite a bit.

- (c) Briefly describe the output of the following UNIX/Linux command.

**\$ man -k password**

**(4 marks)**

**ANSWER IN THIS BOX**

It will print a list of “man” pages that have “password” in their one-line synopses.

- (d) When an IBM PC compatible system is started, the Basic Input Output System (BIOS) tries to read the first block of the boot device.

- (i) What is the name and the size of the first block of the device?
- (ii) What does the first block contain?

**(5 marks)**

**ANSWER IN THIS BOX**

(i) **Master Boot Record (MBR) and its 512 byte size**

(ii) **It contains the boot loader which tells the computer to load the secondary boot program, ie the Kernel of the operating system.**

- (e) The system administrator can request the shutdown command to wait awhile before shutting down the system.

- (i) What does the shutdown command perform during the waiting period?
- (ii) Write down the shutdown command to reboot the system instead of halting it.

**(6 marks)**

**ANSWER IN THIS BOX**

(i) **It sends messages to the logged-in users by progressively warning them of the impending downtime.**

(ii) **# shutdown -r**

2) (a)

- (i) Traditional root account is the most privileged account on a UNIX system. Explain how you configure the system to allow a given non-privileged account to perform privileged tasks?
- (ii) Write down three (3) actions the system administrator needs to perform whenever the security of the system has been compromised.

(5 marks)

**ANSWER IN THIS BOX**

(i) An add-on tool called “sudo” can be used for role-based access control to handle special tasks without the root passwords.

(ii)

- Take the server offline
- Start recovery process

(b)

- (i) Meta package management tools such as *yum* and *apt* have more special features than traditional package management tools for package management. Write down three (3) such features in *yum* or *apt* tool.
- (ii) The traditional RedHat based package management tool is called *rpm*. Write down three (3) activities the *rpm* tool can perform.

(6 marks)

**ANSWER IN THIS BOX**

(i)

- Facilitates the management of inter package dependencies
- Automates the process of upgrading systems
- Simplifies the task of locating & downloading packages

(ii) Rpm tool can perform the following activities: (any three)

- Install packages
- Verify packages
- Query packages
- Delete packages

(c) Following is a line in the output of “*ls -l*” command executed on “*/home/piyal*” directory.

```
-rwxr-xr-- 1 piyal staff 137 2014-08-01 7:20 IT6204.doc
```

- (i) Write down the UNIX/Linux command to change the current permission of the file to only allow the owner of the file to read and write it.
- (ii) Write down the UNIX command to set the *sticky* bit of the “IT6204.doc” file.
- (iii) What is the advantage of setting the sticky bit of a file?
- (iv) We can set the default permissions of a file using the *umask* command. What is the default permission of a newly created file after executing the command *umask 026* on it?

(8 marks)

**ANSWER IN THIS BOX**

- (i) **chmod 600 IT6204.doc or chmod u+rw IT6204.doc**
- (ii) **chmod 4600 IT6204.doc or chmod o+t IT6204.doc**
- (iii) **It prevents the system from abandoning the swap-space image of the program's text portion of the file when its last user terminates.**
- (iv) **User: read & Write; Group: read only; Other: none**

(d)

- (i) What is UNIX/Linux command to mount an ISO 9660 type DVD ROM at */dev/dvdrom* as read only on the */media* mount point?
- (ii) Briefly explain what is meant by a Logical Volume Manager (LVM).

(6 marks)

**ANSWER IN THIS BOX**

- (i) **mount -t iso9660 -o ro /dev/dvdrom /media**
- (ii) **LVM is a system that aggregates physical devices to form a pool of storage called volume groups. The administrator can then sub-divide this pool into logical volumes.**

- 3) (a) Write down four (4) functionalities of the *ifconfig* command.

(4 marks)

**ANSWER IN THIS BOX**

**ifconfig command can be used to**

- **enable/disable network interfaces,**
- **set IP addresses to interfaces,**
- **set Subnet mask of interfaces,**
- **Set other optional parameters related to interfaces**

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

- (i) How does a slave name server get its data from the master name server?
- (ii) What is the difference between a master name server and a caching only name server?
- (iii) What does the \$TTL directive set and where should this be placed in the zone file?

(6 marks)

**ANSWER IN THIS BOX**

**(i) Through a Zone transfer operation**

**(ii) A caching only name server loads the addresses of the servers for the root domain from a start-up file and accumulates the rest of its data by caching answers to the queries it resolves. A caching only name server has no data of its own and is not authoritative for any zone.**

**(iii) The \$TTL directive sets a default value for the time-to-live field of the resource record that follows it. It must be the first line of the zone file.**

**e.g. \$TTL 1d – set the \$TTL directive to one day.**

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

- (i) Write down the commands required to configure an apache server to provide a custom made error page called "MyErrorPage.html" on the "page not found" error.
- (ii) It is recommended to allow multiple requests to be sent over the same TCP connection in Apache, if the HTML pages of a web site have a large number of images. Write down the commands required to configure an apache server to wait 5 seconds for a subsequent request before closing a persistent connection.
- (iii) What is the role of the *MaxRequestsPerChild* directive?

(6 marks)

**ANSWER IN THIS BOX**

- (i) By using ErrorDocument directive we can configure this.  
ErrorDocument 404 MyErrorPage.html
- (ii) Multiple http requests can be made my using the KeepAlive directive.  
KeepAlive On  
KeepAliveTimeout 5
- (iii) The MaxRequestsPerChild directive sets the limit on the number of requests that an individual child process can handle during its lifetime. After MaxRequestsPerChild requests, the child process will die. If MaxRequestsPerChild is zero, the process will live until the server kills it or until the server itself is stopped.

(d) Write down three (3) activities performed by a Mail Transfer Agent (MTA).

(3 marks)

**ANSWER IN THIS BOX**

- Receiving messages from remote mail servers
- Understanding and interpreting recipient's address
- Passing to local delivery agents to be saved to a mailbox

- (e) Consider the following Access Control List (ACL) entries. Also note that the Lab-A is assigned the subnet 10.1.1.0/24 and the Lab-B IPs is assigned the subnet 10.2.1.0/24. Assume that no other entries exist in the squid.conf file.

```
http_access allow Lab-A
http_access allow Lab-B
http_access deny all
```

- (i) In order to provide access only to Lab-A and Lab-B, what other additional entries are required in the above squid.conf file.
- (ii) If the above three access rules were rewritten in the following way, will it provide the same effect as above? Justify your answer.

```
http_access allow Lab-A Lab-B
http_access deny all
```

- (iii) How should ALLOW and DENY rules be ordered in general?

**(6 marks)**

**ANSWER IN THIS BOX**

- (i) **ACL needs to be defined.**

**ACL Lab-A SRC 10.1.1.0/24**

**ACL Lab-B SRC 10.2.1.0/24**

- (ii) **No. It will not be the same. Here, the ALLOW rules are implemented by using the AND operator and both will not be true at the same time and hence, the rule does not have any impact.**

- (iii) **The general practice is to order them in the following order.**

- **specific denial rules**
- **specific acceptance rules**
- **http\_access deny All**

**In this way, if a particular situation fits both a denial and acceptance rule, the access is denied**



4) (a) Scheduled routine tasks can be automated using “cron” utility in UNIX/Linux.

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

**05 06 1,10 1-3 \* /etc/backup.sh**

(ii) What does the following command supposed to perform?

**crontab -l**

**(4 marks)**

**ANSWER IN THIS BOX**

(i) Execute the /etc/backup.sh script on 1<sup>st</sup> and the 10<sup>th</sup> day from January to March at 06:05AM.

(ii) Can view the crontab entries that are already entered to the system

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

(i) Write down the first line of a shell script (“shebang” statement) for the Bash shell located in the /bin directory.

(ii) Write a Bash shell script to perform the following.

The script should obtain an input (numeric value) from the user and if that value is less than **100** it should output “**Inside the Range**”. If it is greater than or equal to **100** it should output “**Outside the Range**”.

**(6 marks)**

**ANSWER IN THIS BOX**

(i) **# /bin/bash**

(ii) **# /bin/bash**

**echo -n “Enter a Number”**

**read InputVar**

**if [ “\$InputVar -lt 100 ”; then**

**echo -n “Inside the Range”**

**else**

**echo -n “Outside the Range”**

**fi**

(c) Explain the functionality of each of the following commands in Unix.

(i) `# find /home -perm 646 -exec chmod 640 {} \;`

(5 marks)

**ANSWER IN THIS BOX**

Find all files with permission 646 (other users have read and write permission) in the /home directory and change them to permission 640 (other users do not have any permission)

(ii) `$ echo "Hello USER $USER"`

Assume that the logged-in user's login account name is Saman.

(5 marks)

**ANSWER IN THIS BOX**

It will output the following string.

Hello USER Saman

(d)

- (i) What is meant by Kernel-based Virtual Machine (KVM)?
- (ii) What is the role of the Linux Kernel in KVM?

(5 marks)

**ANSWER IN THIS BOX**

(i) Kernel-based Virtual Machine (KVM) is a full virtualization tool that has been included in the mainline Linux Kernel. Since KVM virtualization is supported by the CPU hardware, many guest operating systems are supported.

(ii) Under KVM, the Linux kernel itself serves as the hypervisor and guest machines are normal Linux processes. Enormous benefits accompany this unique approach to virtualization.

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