



**UNIVERSITY OF COLOMBO, SRI LANKA**



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



**Academic Year 2016 – 3<sup>rd</sup> Year Examination – Semester 6**

***IT6205 - Systems and Network Administration***

***Structured Question Paper***

**8<sup>th</sup> October, 2016**

**(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 **09 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 (x), the numbers of the questions answered.

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

- 1) (a) Maintaining local documentation 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 maintaining local documentation.

(4 marks)

**ANSWER IN THIS BOX**

Following Activities can be performed:

- Need to document all the changes performed to the basic system
- Need to document the hardware configuration of the running system
- Keeping all the maintenance records of all hardware
- Documenting all local procedures and policies
- (Any other acceptable answer.)

- (b) A software license is a legal instrument governing the usage or redistribution of software.

- (i) Briefly describe the two main categories of free and open source license types.

(3 marks)

- (ii) What is the software license used to govern the usage and distribution of the Linux Kernel?

(3 marks)

**ANSWER IN THIS BOX**

- (i) Open source licenses generally fall under two categories:

Those that aim to preserve the freedom and openness of the software itself ('copyleft' licenses), and those that aim to give freedom to the users of that software ('permissive' licenses).

- (ii) General Public License (GPL)

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

**\$ apropos password**

(4 marks)

**ANSWER IN THIS BOX**

It will print a list of “man” pages that have “password” in their one-line synopses. This is similar to “man -k password” command.

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

- (i) When naming of files and directories, what characters are not allowed in UNIX/Linux?
- (ii) Write down a UNIX/Linux command to determine the type of an existing file?

(5 marks)

**ANSWER IN THIS BOX**

(i) The slash and the null characters are not allowed.

(ii) “ls -ld” 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?  
**# halt**
- (ii) What activities will be performed after issuing the **halt** command?

(6 marks)

**ANSWER IN THIS BOX**

(i) The halt command performs the essential duties required to shut the system down. This is similar to shutdown -n now command.

(ii) Halt command will logs the shutdown, kill nonessential processes, waits for filesystem writes to complete and halts the kernel.

2) (a)

- (i) What is the role of the **su** command in UNIX/Linux?
- (ii) Assume that you know the username and password of a user. Describe how the **su** command can be used to access that user's account. You should provide the complete **su** command.

(5 marks)

**ANSWER IN THIS BOX**

- (i) **su command is called switch user and it prompts for the root password and then starts up a root shell. Root privileges remain in effect until you terminate the shell. su doesn't record the commands executed.**
- (ii) **Issue su command as follows:  
su – username (then enter the correct password)**

(b)

- (i) What are the advantages one can gain by using a RAID system?
- (ii) The standard RAID levels comprise a basic set of RAID configuration that employ various techniques. What is meant by **RAID Level 5**?

(6 marks)

**ANSWER IN THIS BOX**

- (i) **First, it can improve performance by “striping” data across multiple drives, thus allowing several drives to work simultaneously to supply or absorb a single data stream. Second, it can replicate data across multiple drives, decreasing the risk associated with a single failed disk.**
- (ii) **RAID level 5 stripes both data and parity information, adding redundancy while simultaneously improving read performance. In addition, RAID 5 is more efficient in its use of disk space than is RAID 1. If there are N drives in an array (at least three are required), N–1 of them can store data.**

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

**-rwxrwx--x 3 sam staff 153 Oct 08 9:00 project.sh**

- (i) Write down the UNIX/Linux command to change the current permission of the file to allow **only** the owner of the file to **read** and **write** it.
- (ii) If we delete this file will it remove the file contents from the disk? Justify your answer.
- (iii) Write down the UNIX/Linux command to change the group ownership of the above file to the group **sam**.
- (iv) Write down the UNIX/Linux command to set the default permission of newly created files to have **read** and **execute** permissions **only** to the **user** of the file.

**(8 marks)**

**ANSWER IN THIS BOX**

(i) **chmod u+rw project.sh**

(ii) **No. Since link count is 3 it will not remove the data since 2 more files representing the same data.**

(iii) **chown sam:sam project.sh or chown :sam project.sh**

(iv) **umask 366 or umask 0366**

(d)

- (i) What is meant by a process identification number (PID) in UNIX/Linux?
- (ii) What is the UNIX/Linux command that can be used to monitor PIDs?

**(6 marks)**

**ANSWER IN THIS BOX**

(i) **The kernel assigns a unique ID number to every process. Most commands and system calls that manipulate processes require you to specify a PID to identify the target of the operation. PIDs are assigned in order as processes are created.**

(ii) **ps command or top command**

- 3) (a) Write down the basic steps to configure a machine in a LAN to allow it to access the Internet.

(5 marks)

**ANSWER IN THIS BOX**

- Assign a unique IP address and hostname.
- Make sure network interfaces are properly configured at boot time.
- Set up a default route and perhaps other routing.
- Point to a DNS name server to allow access to the rest of the Internet.

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

- (i) What is the difference between a master name server and a slave name server?
- (ii) Is it possible to determine from a query result whether the answer is coming from a master or a slave?
- (iii) What is meant by negative caching in DNS and briefly explain how negative caching can be configured for a given zone.

(12 marks)

**ANSWER IN THIS BOX**

- (i) A Master DNS defines one or more zone files for which this DNS is Authoritative. A Slave DNS gets its zone data using a zone transfer operation (typically from a master) and it will respond as authoritative for those zones for which it is defined to be a 'slave' and for which it has a currently valid zone configuration.
- (ii) It is impossible to determine from a query result that it came from a zone master or slave.
- (iii) DNS servers cache the results of unsuccessful name resolution attempts and this is called negative caching. The value to be used for negative caching in a zone is now specified by the Minimum field in the Start of Authority resource record for each zone.

Continued ...


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

- (i) Write a shell script called **rename.sh** to rename a file when its parameters are given as arguments.  
`% rename file1 file2` (file1 should be renamed as file2)
- (ii) Write a shell script to check the availability of the **/var/log/messages** file and print the message “**File Exists**” if it is available on the given location.
- (iii) What are the three (3) standard streams in UNIX/Linux?

(8 marks)

**ANSWER IN THIS BOX**

(i) The file **rename.sh** should contain:

**#!/bin/bash**

**mv \$1 \$2.**

(ii) The file should contain:

**#!/bin/bash**

**if [ -f /var/log/messages ]**

**then**

**echo "File exists"**

**fi.**

(iii) **0 – Standard Input**

**1 – Standard Output**

**2 – Standard Error**

- 4) (a) The following questions are based on the Apache server configuration.
- (i) What is the difference between IP-based and name-based virtual hosting?
  - (ii) How can we configure an Apache server to provide a custom error page called “UGError.html” when the “page not found” error occurs only in the “undergraduate” directory of the web site?
  - (iii) MaxClients directive can be used to optimise the use of RAM by the Apache server. Briefly describe what outcomes can be expected when setting this to a lower value or higher value.

(12 marks)

**ANSWER IN THIS BOX**

(i) IP- based: Requires different IP address for each virtual host.

Name-based: many host names pointing to same IP address.

(ii) Add the following entry in the httpd.conf file:

<Directory /undergraduate>

ErrorDocument 404 UGError.html

</Direcotry>

(iii) Setting this number too low and resources will go to waste.

Set this number too high and an influx of connections will bring the server to a standstill. Set this number just right and your server will fully utilize the available resources.



- (b) Routine tasks can be scheduled using the **cron** utility in UNIX/Linux.
- (i) What is the outcome of the following **cron** entry?
- 10 05 1,25 1-3 \* /etc/MyCode.sh**
- (c) How can a normal user of the Linux system display all the current **cron** entries?

(7 marks)

**ANSWER IN THIS BOX**

- (i) It will execute the MyCode.sh script on 1<sup>st</sup> and 25<sup>th</sup> days from January to March at 5:10am.
- (ii) With the command
- \$ crontab -l**

- (d)
- (i) What is the difference between **full virtualization** and **para virtualization**?
- (ii) **KVM** is a kernel based visualization machine and is a full visualization tool that has been included in the Linux kernel. Does KVM require any special CPU for its functionality?

(6 marks)

**ANSWER IN THIS BOX**

- (i) Under full virtualization, a hypervisor (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.
- In para virtualization, each OS kernel must be modified to support translations of certain CPU instructions (hyper calls). Here user space applications do not require modifications and run natively on para virtualized server.
- (ii) Yes. It depends on Intel VT or AMD-V processors.

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