



UNIVERSITY OF COLOMBO, SRI LANKA



UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING
(Successor to the Institute of Computer Technology (ICT), University of Colombo)



DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)
Academic Year 2004/2005 – 3rd Year Examination – Semester 5

IT5501: Systems and Network Administration
Structured Question Paper

20th March, 2005
(THREE HOURS)

To be completed by the candidate

BIT Examination Index No: _____

Important Instructions:

- The duration of the paper is **3 (Three) hours**.
- The medium of instruction and questions is English.
- This paper has **4 questions** and **14 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 (×), (e.g. ×) the numbers of the 4 questions answered.

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

- 1) (a) Describe the “Active Directory” concept found in Windows 2000 highlighting its key features.

(05 marks)

ANSWER IN THIS BOX

Active Directory – It is a directory service for Windows 2000. This service is used to store and organize information about the network and the resources which are available on the network.

Forest – It is the full structure of the active directory containing all the domains, trees, organizational units and leaf objects. The forest defines the outside boundaries of the Windows 2000 Active Directory. All objects of the same type (object class) within the forest share the same attributes or properties.

Domain – Domains exist within a forest. There should be at least one domain together with a domain controller for an active directory. Each domain has a unique DNS name and also can have child domains maintaining the DNS naming hierarchy.

- (b) What is the Unix command used to mount a USB flash (thumb) disk to the mount point “/mnt/usb”? Assume that there are no similar entries in /etc/fstab.

(03 marks)

ANSWER IN THIS BOX

mount /dev/sda1 /mnt/usb

- (c) One can define the role of a network/system administrator as follows.
“A Network/System Administrator is a person who takes care of the system resources which provide a useful service to the users.”
Give five (5) reasons which motivate one to be a network/system administrator and five (5) responsibilities of such an administrator.

(05 marks)

ANSWER IN THIS BOX

Motivating factors:

- Lots of variety
- Challenging
- Fulfilling
- Pays well
- Highly employable

Responsibilities:

- Provide services on time
- Inform the users before attending to major upgrades
- ...
- ...
- ...

- (d) List six (6) types of information which are required when setting up user accounts in a networked environment.

(06 marks)

ANSWER IN THIS BOX

- User Naming Convention
- User Password requirements
- Disk quotas and file access rights
- Login hours
- Home Directory
- Path

- (e) Describe three (3) characteristic features of NTFS, which can be considered as enhancements to FAT16/32.

(06 marks)

ANSWER IN THIS BOX

Windows NT and Windows 2000 use NTFS. Data security and file system reliability have been improved in NTFS with the use of relational database transaction processing and object technologies.

File system recovery, large storage media accessibility and support for object oriented applications are the other added features.

Provision of disk quotas for the users and encryption have also been enabled with NTFS. File level compression can also be implemented on NTFS volumes.

- 2) (a) Windows 2000 works with hard disks in two modes: basic and dynamic. The storage areas in dynamic disks are referred to as volumes. With respect to volumes in Windows 2000, describe what is meant by,
- (i) a Mirrored Volume
 - (ii) a Stripped Volume.

(04 marks)

ANSWER IN THIS BOX

- A mirrored volume is made up of two identical copies of a simple volume, each on separate physical hard disks.

- A striped volume contains free space area from 2 to 32 physical hard disks combined into a single volume. Data is written in 64KB chunks to the members of a striped volume in a strip. This is used to provide increased disk read performance.

(b) In Windows 2000, Local Security Policy is used to configure security settings for the local computer. What are the security settings which are possible with regard to this policy?

(05 marks)

ANSWER IN THIS BOX

- Password Policy
- Account Lockout Policy
- Audit policy
- IP Security Policy
- User Rights assignments
- Recovery agent for encrypted data

(c) An inode is a data structure on the disk that describes a file in Unix. What information is stored in a file's inode?

(05 marks)

ANSWER IN THIS BOX

Each inode generally contains:

- The location of the item's contents on the disk, if any,
- The item's type (e.g., file, directory, symbolic link),
- The item's size, in bytes, if applicable,
- The time the file's inode was last modified (the ctime),
- The time the file's contents were last modified (the mtime),
- The time the file was last accessed (the atime),
- A reference count: the number of names the file has,
- The file's owner (a UID),
- The file's group (a GID),
- The file's mode bits.

- (d) In the case of Windows 2000, NTLDR (the NT Loader) is the start-up code controlling the start-up process until it loads and initializes the Windows 2000 kernel. List the steps activated by the NTLDR in this process.

(05 marks)

ANSWER IN THIS BOX

- Starts the mini-file system needed to access the file system on the system volume
- Reads the boot.ini file, displaying the bootstrap loader screen with the operating system selection menu
- Accepts the operating system selection or uses the default if the timeout period expires before a selection is made
- If an operating system other than Windows 2000 is selected, NTLDR loads bootsec.dos, which contain the boot sector that was on the partition when Windows 2000 was installed. If Windows 2000 is selected, NTLDR runs ntdetect.com, a hardware detection program.
- If the start-up is not interrupted and windows 2000 is allowed to continue, it starts in the configuration in use when Windows2000 was last shut down.

- (e) What is meant by the term “swap space” as applied to memory management? In Linux, how can the size of swap space be determined?

(03 marks)

ANSWER IN THIS BOX

A virtual memory partition is traditionally called the swap partition. In other words, it is the virtual memory scratch space which uses, as a rule of thumb, direct disk access to address the partition. It makes sense to allocate a partition twice the size of the total amount of RAM for swap.

- (f) Assume that a system/network administrator loses his “root” password of the system. If the system is a Linux machine, explain how the system administrator can re-establish his control over the system.

(03 marks)

ANSWER IN THIS BOX

There is no way the system administrator can recover the lost password. However, he can restart the system in “single user mode” and reset the root password to a new one.

Thereafter, he can reboot the system in multi-user mode and use the new password.

- 3) (a) Domain Name System (DNS) servers are classified differently depending on how they are configured. The primary DNS server is one such example in this regard.
- (i) Explain the role of the primary DNS server.
 - (ii) Can one configure two primary DNS servers for a given domain (one for backup purposes)?

(05 marks)

ANSWER IN THIS BOX

The primary server is the server from which all data about a domain is derived. The primary server loads the domain’s information directly from a disk file created by the domain administrator. Primary servers are authoritative and their responses are always accurate.

There should be only one primary server for a domain. For backup purposes a secondary DNS server can be configured.

- (b) An organization has a head office at Colombo and three branch locations at Anuradhapura, Jaffna and Matara all of which are inter-connected by wide area links. They have received a public class C IP address range and wish to subnet it according to their requirements. Each of the four branch locations has Ethernet LANs.

The decision to use Variable Length Subnet Masking (VLSM) was necessarily due to the mix of subnets and their sizes. There are seven subnets, and the largest subnet will contain 105 devices. The details of the four branch locations with their hosts are given in the table below. The Anuradhapura, Jaffna and Matara branch locations are connected to Colombo office via three leased lines respectively (i.e. Anuradhapura-Colombo, Jaffna-Colombo and Matara-Colombo WAN links).

The range of available IP addresses is from 172.16.10.0 to 172.16.10.255 only. While explaining a suitable policy, give a complete list of IP addresses and their corresponding subnet masks which can be used to implement this setup.

Network	Location	Type	Hosts
Head-office	Colombo	LAN-Ethernet	105
Branch-office 1	Anuradhapura	LAN-Ethernet	50
Branch-office 2	Jaffna	LAN-Ethernet	12
Branch-office 3	Matara	LAN-Ethernet	12

(08 marks)

ANSWER IN THIS BOX			
Network	Hosts	Subnet Mask	Assigned Addresses 172.16.10.xxx
Head-office	105 + 3	255.255.255.128	0 - 127
Branch-office 1	50 + 1	255.255.255.192	128 - 191
Branch-office 2	12 + 1	255.255.255.240	192-207
Branch-office 3	12 + 1	255.255.255.240	208-223
Colombo- Anuradhapura	2	255.255.255.252	244-247
Colombo- Jaffna	2	255.255.255.252	248-251
Colombo- Matara	2	255.255.255.252	252-255

Continued..

The above IP address allocation is only one possible answer.

- (e) In the Apache server configuration, it is needed to set the “User” and “Group” directives accordingly. What is the purpose of setting these two directives?

(04 marks)

ANSWER IN THIS BOX

Answer to be included ...

- 4) (a) Firewalls can be categorised either as Packet filtering firewalls or as application gateways. List three (3) advantages and three (3) disadvantages of packet filtering firewalls.

(06 marks)

ANSWER IN THIS BOX

Advantages:

- **Low penalty on network performance**
- **Low cost**
- **Transparent to the end user**

Disadvantages:

- **Once the access has been granted there is no inspection of the connection**
- **Offers no user authentication**
- **Writing rules table is very difficult in complex environments**

- (b) Provide (a) command(s) which can be made on a Unix host to assign two (2) IP addresses to a single network interface card. For the above scenario the following information can be used:
- IP address 1 : 192.168.10.5
 IP address 2 : 192.168.10.6
 Interface name : eth0

(03 marks)

<u>ANSWER IN THIS BOX</u>
Using IP aliasing, one can achieve the above requirement.
% ifconfig eth0:0 192.168.10.5
% ifconfig eth0:1 192.168.10.6

- (c) In a Unix system, there is a file called “README” with the following access permission. *Read* access to “all” and *write, execute* access only to the “owner” of the file. How can one add *write* access to the “group” for this file?

(03 marks)

<u>ANSWER IN THIS BOX</u>
chmod g+w README OR
chmod 764 README

- (d) Explain the functionality of each of the following commands in Unix labelled (i), (ii) and (iii).
- (i) `who | wc -l`

(03 marks)

<u>ANSWER IN THIS BOX</u>
Display no. of users currently logged in

(ii) `cat /etc/passwd | awk -F: '{print $1,$6}'`

(03 marks)

ANSWER IN THIS BOX

This will read the password file from the system and print the usernames and their home directory paths. Generally, the /etc/passwd file is readable by everyone. If it is not the case, only the owner of the passwd file can use this command.

(iii) `grep "^$1" </usr/share/dict/words | more`

(03 marks)

ANSWER IN THIS BOX

The input variable passed through "\$1" will be searched in the /usr/share/dict/words file and the output is displayed page by page.

(e) Under what circumstances would a re-compilation of the Linux kernel be required?

(04 marks)

ANSWER IN THIS BOX

Even for a non-programmer, re-compilation is not the forbidding and complex task that it appears to be. Most of the details are handled through batch control files called "Makefiles."

Re-compilation provides complete mastery over how the Linux system is to be configured. Components not needed can be removed to conserve memory usage while unique file managers or various options can be enabled to improve functionality and performance for a particular system.

In other words, re-compilation provides complete control over configuration of the operating system.
