

The University of Nottingham

SCHOOL OF COMPUTER SCIENCE

A LEVEL 4 MODULE, AUTUMN SEMESTER 2010-2011

SYSTEM AND NETWORK ADMINISTRATION

Time allowed TWO hours

Candidates may complete the front cover of their answer book and sign their desk card but must NOT write anything else until the start of the examination period is announced

Answer question ONE and TWO other questions

Only silent, self contained calculators with a Single-Line Display are permitted in this examination.

Dictionaries are not allowed with one exception. Those whose first language is not English may use a standard translation dictionary to translate between that language and English provided that neither language is the subject of this examination. Subject specific translation dictionaries are not permitted.

No electronic devices capable of storing and retrieving text, including electronic dictionaries, may be used.

DO NOT turn your examination paper over until instructed to do so

ADDITIONAL MATERIAL: NONE

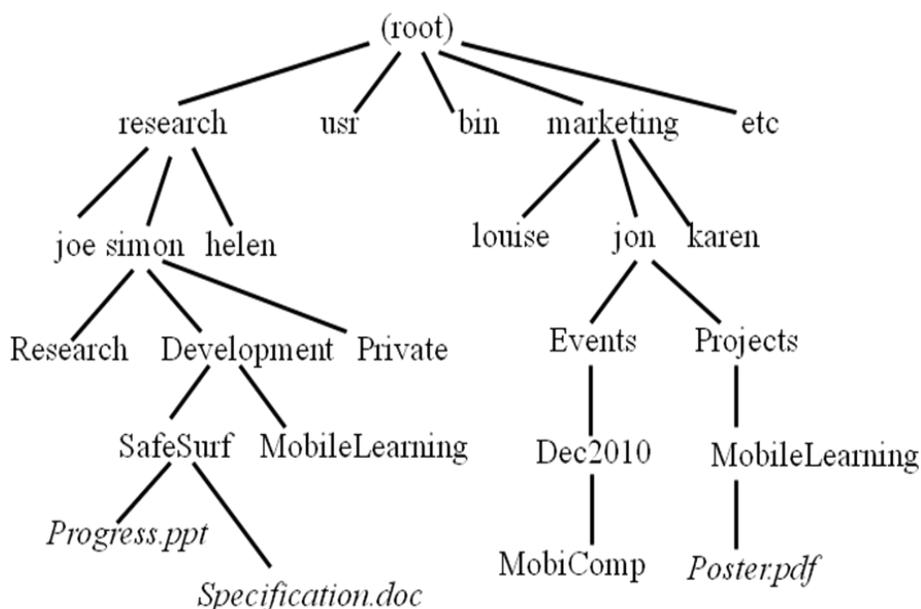
INFORMATION FOR INVIGILATORS: NONE

1. **Compulsory Question [34 marks]**

(a)

- i. Explain the purpose of the UNIX password file. (2 marks)
- ii. Why doesn't the UNIX password file contain passwords? (2 marks)
- iii. Where are passwords stored on a UNIX system? (2 marks)

(b) Examine the following UNIX file structure:



You are logged in as user jon and your current directory is the MobiComp directory.

- i. Give a UNIX command to move up two levels from this position. (1 mark)
- ii. Would you use an absolute or a relative pathname to move to the SafeSurf directory? Give a reason for your answer. (2 marks)
- iii. If you were in the SafeSurf directory, give the UNIX command you would use to change the name of the file Specification.doc to Specification1.0.doc (1 mark)
- iv. You then execute the command: **cd ~** What happens as a result of this command? (1 mark)
- v. Give a UNIX command which searches from the root for a file called **MobileLearning** (1 mark)
- vi. Do you think the Research and Marketing directories and their subdirectories would be stored on the same physical device? Explain your answer. (2 marks)

QUESTION 1 CONTINUED ON NEXT PAGE

QUESTION 1 CONTINUED

- (c) Outline the steps required to create a new user account in an operating system.
(5 marks)
- (d) You are a system administrator of a UNIX machine and you need to change it so that it is running in single user mode
- i. Explain how you would do this;
(2 marks)
 - ii. What would happen inside the machine during reboot, with respect to the hardware and processes?
(5 marks)
- (e) Explain what a UNIX run level is and how it relates to, and uses, boot scripts.
(4 marks)
- (f) You want to perform some maintenance work on your organisation's database but the database runs on the UNIX machine that hosts user files. How would you manage this so that you can do the required maintenance whilst still allowing users to access their files?
(4 marks)

2. **Question on Active Directory [33 marks]**

(a) The Microsoft Active Directory (AD) aids the management of resources on a network.

- i. Name three resources that can be managed by AD;
(3 marks)
- ii. Explain, with an example, the difference in functionality of Organisational Units (OUs) and groups;
(6 marks)
- iii. If you wanted to restrict the applications that a certain set of users could run how would you do this in AD?
(4 marks)

(b) A company foobar.com has the following departments:

Department	Number of employees	Number of workstations	Software used	Location
Development	35	40	Visual C++, Word	Manchester
Marketing	7	12	Word, Photoshop, Powerpoint	London
Sales	10	10	Word, Excel	London
Finance	17	20	Excel, Word	London
Human Resources	5	5	Word	Birmingham

- i. Propose two alternative AD structures for this organisation and draw the tree structures. Explain why you have chosen these structures;
(6 marks)
- ii. Briefly list the considerations the company would have to make when choosing between these two alternatives.
(5 marks)

(c) Explain the role of the domain controller.

(5 marks)

(d) Why might an organisation use more than one domain controller? What might be the consequences of using only one?

(4 marks)

3. Question on File Sharing (33 marks)

(a) The following is part of a Samba **smb.conf** file:

```
[global]
hosts allow = moriarty, wilbur
hosts deny = duck
valid users = gtr, @compsci, @mrl @lsri
invalid users = root, admin, administrator
max log size = 2000
[compdir]
path = /cs/staff/new
comment = New Projects
read only = no
case sensitive = yes
force group compscientists
read list = gtr, @compsci, @mrl
write list @mrl
```

Write the changes that you would need to make to do the following:

- i. Give a user **jsmith** access to the Samba filesystems. You should specify that this user has read and write access; (3 marks)
- ii. Give the group **admin** access to the Samba filesystems; (2 marks)
- iii. Add a new share called **research** which allows remote systems to access the local path **/cs/research** (3 marks)

(b) Briefly describe how Sun Microsystems' RPC portmap operates. What are the benefits of using portmap? (7 marks)

(c) Describe Sun Microsystems' Network File System (NFS) in terms of the following:

- i. The role of NFS; (1 mark)
- ii. The role of file handles; (3 marks)
- iii. A brief description of the basic elements of a file handle; (6 marks)
- iv. The two protocols that NFS uses to achieve its functions. (8 marks)

4. Question on Processes (33 marks)

(a) Briefly explain the difference between the UNIX **at** and the UNIX **cron** utilities (2 marks)

(b) The following is a line taken from a **crontab.cron** file:

```
* 0,3 * * 1-5 echo "Take a break"
```

i. What will this line do? (5 marks)

ii. Add a new line to schedule UNIX to run the **du** command every day of the week at 18:30 (3 marks)

(c) Why is **cron** a particularly useful utility for a system administrator? (2 marks)

(d) What is a UNIX signal? (3 marks)

(e) Why are there different types of signal? (2 marks)

(f) You are a system administrator and you suspect that a process somewhere might be taking up too much CPU time.

i. How would you check for processes taking up excessive CPU time? (2 marks)

ii. Give one or more commands that you might use to find and terminate the process. (3 marks)

(g) Explain the differences between parent and child processes (5 marks)

(h) A user executes the following at the command line:

```
emacs project.txt
```

...to allow them to edit the file **project.txt**. They then wish to execute another command in the same shell.

i. How would they do this without killing the emacs process? (2 marks)

ii. How would they subsequently switch emacs so that it is running in the background, without killing it? (2 marks)

iii. The user then wishes to kill this background emacs process – how would they do this? (2 marks)

5. Question on Firewalls (33 marks)

- (a) Briefly outline the main components of a firewall system with a short description of each. (6 marks)
- (b)
- i. Briefly describe the packet filtering approach to firewall provision. (3 marks)
 - ii. Do you think this approach is an effective one? Give arguments to support your answer. (7 marks)
- (c) You are a system administrator responsible for a Local Area Network connecting 120 hosts. You have been given the task of implementing a new firewall.
- i. Explain the considerations you would have to make when planning this firewall. (8 marks)
 - ii. You then need to consider how to implement the firewall's policy. Explain what firewall policy is. (3 marks)
- (d) Briefly explain TWO alternative solutions to firewalls which help with the management of network security (6 marks)