NAMIBIA UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF COMPUTING AND INFORMATICS
DEPARTMENT OF COMPUTER SCIENCE
Private Bag 13388, 13 Jackson Kaujeua Street, Windhoek, Namibia
Tel: +264-(0)61–207–2052 Fax: +264–(0)61–207–2051

Curriculum:	Bachelor of Computer Science
Subject Code:	SAD622S
Subject:	Systems Administration
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Duration:	120 minutes
Paper:	Theory
Total Marks:	80

1st Opportunity Examination Paper

Lecturer/First Examiner : Peter Gallert
Moderator : Isaac Nhamu

This examination paper consists of 5 pages (including the front page).

Student Name: _____

Student Number: _____

Instructions

1. Answer all questions.
2. When answering questions you should be led by the allocation of marks.
3. Do not use or bring into the examination venue books, mobile devices and other material that may provide you with unfair advantage. Should you be in possession of one right now, draw the attention of the examination officer or invigilator.
4. NUST's examination rules and regulations apply.

1. Briefly explain the subject terms below:
   (a) File system (2)
   (b) Non–volatile memory (2)
   (c) Serial bus (2)
   (d) Memory address (2)
   (e) Pointer (2)

2. Give **an example** of client–server architecture [1 mark] and explain how the example *that you have given*, works. [2 marks] (3)

3. List three components of the USB bus [1 mark each]. **For each** of the components you listed, give an example of data that would be carried on this bus [1 mark each]. (6)

4. A user is upgrading his scanner to a more modern version. But the new scanner is not working, and an online help forum advises to download and install a new **driver** for the scanner. (3)

   Briefly explain why the old driver cannot be re–used, even though it is the same computer and operating system using it.

5. A **RAID 4** array of three disks is given (block striping, 2 data disks, 1 parity disk). Block 1 on data disk 1 starts with: (3)

   ```
   00111010.......
   ```

   Block 1 on data disk 2 starts with:

   ```
   01010101.......
   ```

   How will the data on the parity disk be determined, and what will be the first 8 bits in block 1 of disk 3, the parity disk? Explain briefly [1 mark] and show your calculations [2 marks].

6. When a computer is switched on:
   (a) After the hardware is powered up, the first tasks will not be executed through software but through which component? (1)
   (b) Which computer component will take on the task to copy the code of the operating system to memory, so that that processor can execute it? (1)
   (c) Which process will be the first to run on the processor? (1)

7. Compare and contrast the POSIX "read" permission and the MS Windows "hidden" file attribute.

   Assume that file `A.txt` on a Linux operating system is **in a folder** that has no "read" permissions set for anyone, and that file `B.txt` on an MS Windows operating system has the "hidden" attribute set.

   (a) List one similarity that applies both to file `A.txt` and file `B.txt`. (1)

   (b) What can be done to allow user Charlie to view file `A.txt`? Be specific and mention all steps. One possibility is sufficient. (2)

   (c) What can be done to allow user Charlie to view file `B.txt`? Be specific and motivate your answer. (2)

8. On a Linux system a user issues the command `ls -l /home` and gets the following output:

```
alice@lenovo:~$ ls -l /home
drwxr-x--- 25 alice common 4096 Sep 20 12:56 alice
alice@lenovo:~$
```

   Explain this output:

   (a) What do the leftmost 10 characters (bolded) mean?—Explain all 10 characters (7)
   `drwxr-x---` 25 alice common 4096 Sep 20 12:56 alice

   (b) What does the first occurrence of "alice" (bolded) mean? (1)
   drwxr-x--- 25 **alice** common 4096 Sep 20 12:56 alice

   (c) What does the second occurrence of "alice" (bolded) mean? (1)
   drwxr-x--- 25 alice common 4096 Sep 20 12:56 **alice**

   (d) What does the listed date and time (bolded) mean? Also give an example for an action that would lead to an update of this date and time. (2)
   drwxr-x--- 25 alice common 4096 **Sep 20 12:56** alice

   (e) How many users have local accounts on this computer? Motivate your answer briefly. (2)

9. The login password in the INCEIT security lab is `DOr!to$` — a reminiscence of the Doritos maize chips.

   (a) Briefly explain **two major** weaknesses of this password [2 marks each] (4)

   (b) Estimate how many *shannon* (that is, bits required to store) this password has. Show your calculations. (5)

10. Your class has ended in an FCI lab at NUST. You were using a lab computer running MS Windows. Before you leave your desk, you make sure nobody can access data from your session by: (6)

    i. Pressing Start ⇒ Power off

    ii. Removing the power cord from the computer

    iii. Pressing <CRTL>—<ALT>–<DEL> and selecting "Lock screen"

    For each of the possibilities above, state how the same action can be emulated on a MS Windows guest in a hypervisor (VirtualBox / VMWare) [2 marks each]

11. For each of the Linux commands (first line) and their respective output (subsequent lines) below, briefly explain why its execution results in an error [1 mark each]. Also state what the correct command would be [1 mark each].

    (a) (2)

```
peter@lenovo:~$ sudu ls -l /dev/sdb1
Command 'sudu' not found, did you mean:
  command 'tudu' from deb tudu (0.10.4-1)
  command 'sudo' from deb sudo (1.9.9-1ubuntu2.5)
  command 'sudo' from deb sudo-ldap (1.9.9-1ubuntu2.5)
Try: sudo apt install <deb name>
```

    (b) (2)

```
peter@lenovo:~$ tail -11 /etc/shadow
tail: cannot open '/etc/shadow' for reading: Permission denied
```

12. Consider the following interaction between user and Linux command line:

```
peter@lenovo:~$ find /usr/bin -name peter
peter@lenovo:~$
```

    Note that, while the command does not give any output, a new command prompt appears.

    (a) Is this an error? How can you tell? (2)

    (b) Why is there no output? (3)

13. Consider the following interaction between user and Linux command line:

```
peter@lenovo:~$ ping 169.9.0.1
PING 169.9.0.1 (169.9.0.1) 56(84) bytes of data.
```

    Note that no new command line prompt appears after the initial feedback in the second line.

    (a) Is this an error? How can you tell? (2)

    (b) Why is there no output? (2)

    (c) How will the user get their normal command prompt back? (1)

14. Ottilie has configured the DNS server for her company. While the DNS works as expected on the company computers, local names like `ADMINPC` are not resolving on the DNS server machine. So for instance, a `ping ADMINPC` is successful on all company PCs, but it times out when issued on the DNS server. (5)

    Ottilie suspects some IP address problem and issues the command `ipconfig /all` on the DNS server. The output contains the following lines:

```
Ethernet adapter Ethernet:

   Description . . . . . . . . . . . : Intel(R) PRO/1000
                                       MT Desktop Adapter
   Physical Address. . . . . . . . . : 08-00-27-7C-CB-7F
   DHCP Enabled. . . . . . . . . . . : Yes
   IPv4 Address. . . . . . . . . . . : 172.16.1.4(Preferred)
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Lease Obtained. . . . . . . . . . : Thursday, September 11,
                                       2025 2:02:29 PM
   Lease Expires . . . . . . . . . . : Thursday, September 11,
                                       2025 8:06:50 PM
   Default Gateway . . . . . . . . . : 172.16.1.1
   DHCP Server . . . . . . . . . . . : 172.16.1.3
   DNS Servers . . . . . . . . . . . : 8.8.8.8
```

    Help her troubleshoot the problem, and suggest a specific solution.

End of question paper