Computer Architecture and Technology Convergence Assignment

# 

[**Q1: Binary Arithmetic:**](#_ip2zc4m6087) **2**

[Q1.1](#_uf97le40bhf5) 2

[Q1.2](#_z27h7xb5otv4) 3

[Q1.3](#_3jeltpp0zmue) 3

[Q1.4](#_w4hozqkiqfp2) 4

[Q1.5](#_5vqnalefldnf) 4

[**Q2: Linux Assignment:**](#_2i3wyluqfb4) **5**

[Q2.1](#_pvp5j6q9y727) 5

[Q2.2](#_ez95nocnwiyb) 9

[Q2.3](#_ifdlhxr6tu6r) 14

[Q2.3.1](#_dmcdxsdnqwxf) 14

[Q2.3.2](#_834lvm43tk3w) 14

[Q2.4](#_ehpl8py7v38t) 15

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# Q1: Binary Arithmetic:

## Q1.1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 |
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 0 | 1 | 1 | 0 | 1 | 1 |
|  |  | 0 | 0 | 1 | 0 | 1 | 1 |
|  |  | 1 | 1 | 0 | 1 | 1 | 0 |
|  | 0 | 1 | 0 | 0 | 1 | 1 | 0 |

Check:

**11011** 1\*1 + 1\*2 + 0\*4 + 1\*8 + 1\*16 = 27

**1011** 1\*1 + 1\*2 + 0\*4 + 1\*8 = 11

**Answer = 100110** 0\*1 + 1\*2 + 1\*4 + 0\*8 + 0\*16 + 1\*32 = 38 = (27 + 11)

## 

## Q1.2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| -31 | | |  | -59 | | |
| 31 | 1 | 20 |  | 59 | 1 | 20 |
| 15 | 1 | 21 |  | 29 | 1 | 21 |
| 7 | 1 | 22 |  | 14 | 0 | 22 |
| 3 | 1 | 23 |  | 7 | 1 | 23 |
| 1 | 1 | 24 |  | 3 | 1 | 24 |
|  |  |  |  | 1 | 1 | 25 |

8-bit: 00011111 8-bit: 00111011

Invert + 1: 11100001 invert + 1: 11000101

**Answer =** **11100001 Answer =** **11000101**

## Q1.3

11101001

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 |
| 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |
| 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 |

Decimal = 1 + 2 + 4 + 16 = 23

**Answer = -23**

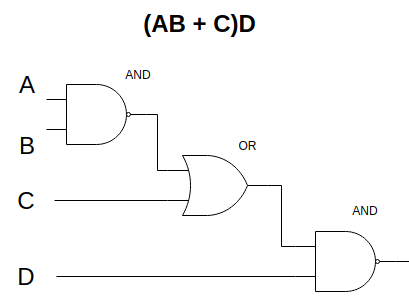
## Q1.4

|  |  |  |  |
| --- | --- | --- | --- |
| X | Y | D | Bout |
| 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 |

Circuit use:

Half subtractor circuit used to perform subtraction of two bits.

## Q1.5



Created using <https://online.visual-paradigm.com/app/diagrams/#proj=0&type=LogicDiagram>

# 

# 

# Q2: Linux Assignment:

## Q2.1

**echo hello world:**

**echo** is a command used in the command line or OS shell to print a string or text that has been passed as an argument of the command, e.grunning echo hello world outputs hello world on the command line or terminal.

***echo*** *[OPTION] [ARGUMENT]*

**passwd:**

**passwd** command is used to change the password of the user account, root or admin user can use it to change the password of any account on the system, while normal user can only use it to change the password of their own account.

***passwd*** *[OPTION] [USERNAME]*

**date:**

**date** command displays the current day of the week, month & date, time in 24hr format, time zone and year.

***date*** *[OPTION] [+FORMAT]*

**hostname:**

**hostname** command displays the name of the system’s DNS (domain name system), e.g the computers name or label on the network. The command can also be used to set the systems’s host or domain name.

***hostname*** *[OPTION] [FILE]*

**arch:**

**arch** command displays the computer’s architecture e.g my laptop’s architecture: x86\_64

***arch*** *[OPTION]*

**uname -a:**

**uname**  command displays information about the operating system name and system hardware of the computer, following the command with the option **-a** (--all) will print all the information in the following order:

kernel-name, nodename, kernel-release, kernel-version, machine, processor, hardware-platform, operating-system. e.g my laptop’s information:

Linux Paul-HP-Laptop 4.15.0-88-generic #88-Ubuntu SMP Tue Feb 11 20:11:34 UTC 2020 x86\_64 x86\_64 x86\_64 GNU/Linux

***uname*** *[OPTION]*

**dmesg | more:**

**dmesg** command is used to display the kernel related messages, it is used when troubleshooting on linux systems.

**more** command is used to display the text file or output in the terminal or command line, it provides viewing the output or text one screen at a time, allowing for easy scrolling through large text files or outputs.

**|** (pipe) is used to combine two or more commands on the command line, is a form of redirection of the output of one command as the input into another command.

e.g the output of **dmesg** has been redirected and viewed through the **more** command, allowing the user to easily scroll through the large output file.

**uptime:**

**uptime** command returns the current time, the length of time the system is running, the number of users currently logged in and the average load time for the past 1, 5 & 15 mins respectively.

**uptime** [OPTION]

**whoami:**

**whoami** command returns the username of the current user.

**who:**

**who** command prints information about all users currently logged into the system.

***who*** *[OPTION]... [ FILE | ARG1 ARG2 ]*

**last:**

**last** command displays a list of users who have last logged in.

**last** [options] [username...] [tty...]

**finger:**

**finger** command displays information about the system’s users, note that the finger package is not installed by default on linux systems/

**w:**

**w** command shows who is currently logged in and their processes on the machine or system.

**w** [options] user [...]

**top:**

**top** command displays a real-time summary view of the processes and tasks currently running on the linux system.

**echo $shell:**

Displays which shell or command interpreter the linux system is using, e.g /bin/bash indicates the bash shell or bourne-again shell.

**echo {con,pre}{sent,fer}{s,ed}:**

outputs all the combinations of words combined between the different sets.

i.e consents consented confers confered presents presented prefers prefered

**man ls:**

**man** command displays the manual associated with a program, utility or function.

**ls**  command lists the files information of a given file directory.

Combined together the **man ls,** provides the manual of the **ls** command.

**man who:**

Similar to above provides the manual associated with the who command.

**clear:**

**clear** command, clears the terminal window of all previous text and commands inputted.

**cal 2000:**

**cal** displays a calendar, **cal 2000** displays the calendar for the year 2000.

**cal 9 1752:**

Displays the month of september of the year 1752, note that 11 days are missing from the calendar, which has to do with Britain deciding to abandon the Julian calendar in favour of the Gregorian.

**yes please:**

The **yes** command outputs a continuous and constant stream of the inputted string, in this instance please is the string.

***yes*** *[string]*

**time sleep 5:**

**time** command is used to execute a command and provides a summary of the real-time, user CPU time and system CPU time spent executing that command.

**sleep** command pauses for a set amount of time specified by the user.

e.g time sleep 5

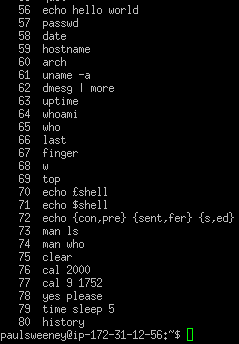
real 0m5.012s

user 0m0.000s

sys 0m0.005s

**history:**

**history** command displays the list of commands executed since the start of the session.



note: echo $shell command was originally entered incorrectly in the above screenshot, should be echo $SHELL, see below screenshot.



## Q2.2

date command output:

Mon Mar 30 14:12:14 UTC 2020

hostname command output:

ip-172-31-12-56

arch command output:

x86\_64

uname command output:

Linux

uptime command output:

14:12:14 up 21 days, 16:42, 4 users, load average: 0.00, 0.00, 0.00

whoami command output:

paulsweeney

who command output:

paulsweeney pts/0 2020-03-30 14:11 (51.37.10.138)

ainararuiz pts/1 2020-03-30 13:52 (188.141.96.141)

thiernodiallo pts/2 2020-03-28 22:40 (92.235.49.167)

michellemoran pts/4 2020-03-30 13:50 (88.81.109.208)

finger command output:

Login Name Tty Idle Login Time Office Office Phone

ainararuiz pts/1 Mar 30 13:52 (188.141.96.141)

michellemoran pts/4 4 Mar 30 13:50 (88.81.109.208)

paulsweeney pts/0 Mar 30 14:11 (51.37.10.138)

thiernodiallo pts/2 1d Mar 28 22:40 (92.235.49.167)

w command output:

14:12:14 up 21 days, 16:42, 4 users, load average: 0.00, 0.00, 0.00

USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT

paulswee pts/0 51.37.10.138 14:11 4.00s 0.04s 0.00s w

ainararu pts/1 188.141.96.141 13:52 54.00s 0.16s 0.11s vi CATC.sh

thiernod pts/2 92.235.49.167 Sat22 39:32m 0.04s 0.04s -bash

michelle pts/4 88.81.109.208 13:50 4:45 0.11s 0.06s vim michellemoran.txt

top command output:

top - 14:12:15 up 21 days, 16:42, 4 users, load average: 0.00, 0.00, 0.00

Tasks: 135 total, 1 running, 133 sleeping, 1 stopped, 0 zombie

%Cpu(s): 0.1 us, 0.1 sy, 0.0 ni, 99.8 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st

KiB Mem : 1014424 total, 154584 free, 101284 used, 758556 buff/cache

KiB Swap: 0 total, 0 free, 0 used. 682140 avail Mem

PID USER PR NI VIRT RES SHR S %CPU %MEM TIME+ COMMAND

1 root 20 0 37692 5704 4024 S 0.0 0.6 0:35.84 systemd

2 root 20 0 0 0 0 S 0.0 0.0 0:00.01 kthreadd

3 root 20 0 0 0 0 S 0.0 0.0 0:22.58 ksoftirqd/0

5 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 kworker/0:0H

7 root 20 0 0 0 0 S 0.0 0.0 0:29.83 rcu\_sched

8 root 20 0 0 0 0 S 0.0 0.0 0:00.00 rcu\_bh

9 root rt 0 0 0 0 S 0.0 0.0 0:00.00 migration/0

10 root rt 0 0 0 0 S 0.0 0.0 0:08.87 watchdog/0

11 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kdevtmpfs

12 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 netns

13 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 perf

14 root 20 0 0 0 0 S 0.0 0.0 0:00.01 xenwatch

15 root 20 0 0 0 0 S 0.0 0.0 0:00.00 xenbus

17 root 20 0 0 0 0 S 0.0 0.0 0:00.46 khungtaskd

18 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 writeback

19 root 25 5 0 0 0 S 0.0 0.0 0:00.00 ksmd

20 root 39 19 0 0 0 S 0.0 0.0 0:03.52 khugepaged

21 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 crypto

22 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 kintegrityd

23 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

24 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 kblockd

25 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 ata\_sff

26 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 md

27 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 devfreq\_wq

30 root 20 0 0 0 0 S 0.0 0.0 0:00.52 kswapd0

31 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 vmstat

32 root 20 0 0 0 0 S 0.0 0.0 0:00.00 fsnotify\_mark

33 root 20 0 0 0 0 S 0.0 0.0 0:00.00 ecryptfs-kthrea

49 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 kthrotld

50 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

51 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

52 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

53 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

54 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

55 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

56 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

57 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

58 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

59 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

60 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

61 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

62 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

63 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

64 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

65 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

66 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

67 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

68 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

69 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

70 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

71 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

72 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

73 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

74 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 nvme

75 root 20 0 0 0 0 S 0.0 0.0 0:00.00 scsi\_eh\_0

76 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 scsi\_tmf\_0

77 root 20 0 0 0 0 S 0.0 0.0 0:00.00 scsi\_eh\_1

78 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 scsi\_tmf\_1

83 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 ipv6\_addrconf

94 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

97 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 deferwq

249 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 raid5wq

280 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 bioset

302 root 20 0 0 0 0 S 0.0 0.0 0:06.14 jbd2/xvda1-8

303 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 ext4-rsv-conver

368 root 0 -20 0 0 0 S 0.0 0.0 0:00.48 kworker/0:1H

369 root 20 0 28436 2648 2284 S 0.0 0.3 5:35.60 systemd-journal

383 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 iscsi\_eh

390 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 ib\_addr

392 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 ib\_mcast

396 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 ib\_nl\_sa\_wq

398 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 ib\_cm

399 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 iw\_cm\_wq

402 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 rdma\_cm

407 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kauditd

422 root 20 0 102964 1280 1100 S 0.0 0.1 0:00.00 lvmetad

459 root 20 0 42440 3736 2852 S 0.0 0.4 0:01.04 systemd-udevd

528 root 0 -20 0 0 0 S 0.0 0.0 0:00.05 loop0

532 root 0 -20 0 0 0 S 0.0 0.0 0:00.04 loop1

541 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 loop2

546 root 0 -20 0 0 0 S 0.0 0.0 0:00.02 loop3

747 systemd+ 20 0 100320 2324 2120 S 0.0 0.2 0:01.20 systemd-timesyn

979 root 20 0 16120 2948 2096 S 0.0 0.3 0:00.61 dhclient

1135 root 20 0 275276 5876 4440 S 0.0 0.6 2:37.89 accounts-daemon

1138 root 20 0 5216 112 0 S 0.0 0.0 0:51.34 iscsid

1139 root 10 -10 5716 3508 2428 S 0.0 0.3 3:54.82 iscsid

1140 root 20 0 27724 2532 2252 S 0.0 0.2 0:02.32 cron

1147 root 20 0 637140 3524 1336 S 0.0 0.3 0:08.74 lxcfs

1149 root 20 0 218560 5164 3408 S 0.0 0.5 0:12.55 amazon-ssm-agen

1153 daemon 20 0 26040 1924 1728 S 0.0 0.2 0:00.02 atd

1154 message+ 20 0 42896 3468 2976 S 0.0 0.3 0:03.47 dbus-daemon

1181 syslog 20 0 260624 3724 2192 S 0.0 0.4 1:37.63 rsyslogd

1188 root 20 0 28612 2904 2544 S 0.0 0.3 0:02.22 systemd-logind

1198 root 20 0 4392 1272 1188 S 0.0 0.1 0:00.00 acpid

1206 root 20 0 240380 16772 4696 S 0.0 1.7 0:45.57 snapd

1219 root 20 0 279236 6832 5636 S 0.0 0.7 0:00.57 polkitd

1239 root 20 0 13368 140 0 S 0.0 0.0 0:00.10 mdadm

1245 root 20 0 173336 15420 7352 S 0.0 1.5 0:00.11 unattended-upgr

1300 root 20 0 14468 1608 1472 S 0.0 0.2 0:00.02 agetty

1309 root 20 0 14652 1460 1332 S 0.0 0.1 0:00.04 agetty

1510 root 20 0 65508 4008 3292 S 0.0 0.4 1:38.40 sshd

5169 root 20 0 92828 6904 5976 S 0.0 0.7 0:00.05 sshd

5185 thierno+ 20 0 45164 4560 3848 S 0.0 0.4 0:00.09 systemd

5186 thierno+ 20 0 61092 1788 0 S 0.0 0.2 0:00.00 (sd-pam)

5255 thierno+ 20 0 92828 4336 3392 S 0.0 0.4 0:00.16 sshd

5256 thierno+ 20 0 21384 5172 3236 S 0.0 0.5 0:00.04 bash

16110 root 20 0 0 0 0 S 0.0 0.0 0:00.22 kworker/0:1

21868 root 20 0 92828 6868 5940 S 0.0 0.7 0:00.01 sshd

21873 michell+ 20 0 45164 4640 3928 S 0.0 0.5 0:00.00 systemd

21875 michell+ 20 0 61144 1792 0 S 0.0 0.2 0:00.00 (sd-pam)

21919 michell+ 20 0 92828 3492 2568 S 0.0 0.3 0:00.01 sshd

21920 michell+ 20 0 21384 5168 3236 S 0.0 0.5 0:00.03 bash

21968 root 20 0 92828 6868 5936 S 0.0 0.7 0:00.00 sshd

21972 ainarar+ 20 0 45164 4688 3980 S 0.0 0.5 0:00.01 systemd

21973 ainarar+ 20 0 61144 1792 0 S 0.0 0.2 0:00.00 (sd-pam)

22018 ainarar+ 20 0 92828 3592 2664 S 0.0 0.4 0:00.10 sshd

22019 ainarar+ 20 0 21384 5152 3216 S 0.0 0.5 0:00.05 bash

22152 root 20 0 0 0 0 S 0.0 0.0 0:07.32 kworker/u30:0

22230 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kworker/0:0

22324 michell+ 20 0 52340 8228 5484 T 0.0 0.8 0:00.02 vim

22361 ainarar+ 20 0 52972 8680 5508 S 0.0 0.9 0:00.11 vi

22368 michell+ 20 0 52584 8464 5624 S 0.0 0.8 0:00.06 vim

22483 root 20 0 92828 6948 6020 S 0.0 0.7 0:00.01 sshd

22489 paulswe+ 20 0 45164 4640 3928 S 0.0 0.5 0:00.00 systemd

22491 root 20 0 0 0 0 S 0.0 0.0 0:00.00 kworker/0:2

22492 paulswe+ 20 0 61144 1792 0 S 0.0 0.2 0:00.00 (sd-pam)

22548 paulswe+ 20 0 92828 3380 2456 S 0.0 0.3 0:00.00 sshd

22549 paulswe+ 20 0 21384 5104 3172 S 0.0 0.5 0:00.04 bash

22572 root 20 0 92676 6532 5624 S 0.0 0.6 0:00.00 sshd

22573 sshd 20 0 65508 3292 2572 S 0.0 0.3 0:00.00 sshd

22574 paulswe+ 20 0 11300 2996 2728 S 0.0 0.3 0:00.00 script.sh

22584 paulswe+ 20 0 40384 3516 2984 R 0.0 0.3 0:00.00 top

24929 root 20 0 0 0 0 S 0.0 0.0 0:01.94 kworker/u30:1

26286 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 xfsalloc

26287 root 0 -20 0 0 0 S 0.0 0.0 0:00.00 xfs\_mru\_cache

history command output:

372 # variable t used for output text file

373 t=paulsweeney.txt

374 # date command

375 echo -e '\e[31mdate command output:\e[0m' > $t # using echo escape character to format text

376 date >> $t

377 echo >> $t

378 # hostname command

379 echo -e '\e[31mhostname command output:\e[0m' >> $t

380 hostname >> $t

381 echo >> $t

382 # arch command

383 echo -e '\e[31march command output:\e[0m' >> $t

384 arch >> $t

385 echo >> $t

386 # uname command

387 echo -e '\e[31muname command output:\e[0m' >> $t

388 uname >> $t

389 echo >> $t

390 # uptime command

391 echo -e '\e[31muptime command output:\e[0m' >> $t

392 uptime >> $t

393 echo >> $t

394 # whoami command

395 echo -e '\e[31mwhoami command output:\e[0m' >> $t

396 whoami >> $t

397 echo >> $t

398 # who command

399 echo -e '\e[31mwho command output:\e[0m' >> $t

400 who >> $t

401 echo >> $t

402 # finger command

403 echo -e '\e[31mfinger command output:\e[0m' >> $t

404 finger >> $t

405 echo >> $t

406 # w command

407 echo -e '\e[31mw command output:\e[0m' >> $t

408 w >> $t

409 echo >> $t

410 # top command

411 echo -e '\e[31mtop command output:\e[0m' >> $t

412 top -b -n 1 >> $t

413 echo >> $t

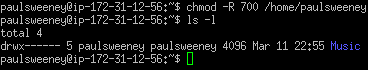
414 # history command

415 echo -e '\e[31mhistory command output:\e[0m' >> $t

416 history 45 >> $t

## Q2.3

### Q2.3.1



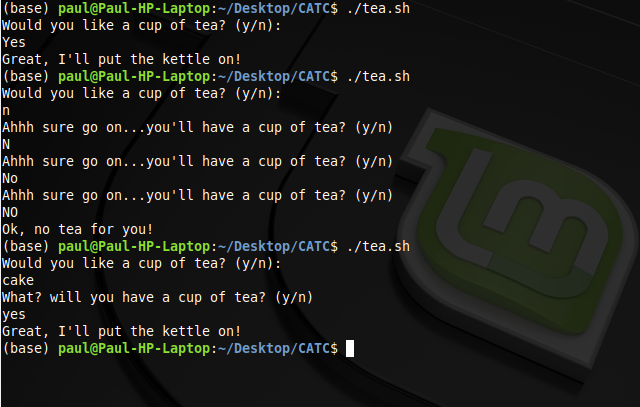
### Q2.3.2



## 

## 

## Q2.4



#!/bin/bash

# COMPUTER ARCHITECTURE & TECHNOLOGY CONVERGENCE 2020

# Tea Shell Script

# Author: Paul Sweeney

echo 'Would you like a cup of tea? (y/n):'

n\_count=0

while read answer

do

if [[ $answer =~ ^(yes|y|Yes|Y|YES)$ ]]

then

echo "Great, I'll put the kettle on!"

exit

elif [[ $answer =~ ^(no|n|No|N|NO)$ ]]

then

n\_count=$(($n\_count+1))

if [[ $n\_count -lt 4 ]]

then

echo "Ahhh sure go on...you'll have a cup of tea? (y/n)"

elif [[ $n\_count == 4 ]]

then

echo "Ok, no tea for you!"

exit

fi

else

echo "What? will you have a cup of tea? (y/n)"

fi

done