

COMPUTER SCIENCE TRIPOS Part IB – 2020 – Paper 4

7 Security (mgk25)

- (a) (i) What effect does the Unix/Linux/macOS system call `chroot` have (or the GNU/Linux command-line tool of the same name)? [2 marks]
- (ii) What kinds of resource can `chroot` restrict access to? How can the developer of a program  $P$  use `chroot`? How can the user of a program  $P$  use `chroot`? [4 marks]
- (iii) Why would a developer or user of a program want to do this? Give a concrete example. [4 marks]
- (iv) Name two other kinds of resource on a Unix system for which access is not affected by `chroot`. [2 marks]

(b) User `jane` types the following three commands into her Linux shell:

```
$ id
uid=1002(jane) gid=1002(jane) groups=20(dialout),513(staff)
$ ls -l ptool
-rwsr-xr-x 1 ptusr ptgrp 59640 Mar 22 2020 ptool
$ ./ptool
```

(i) State the various user and group identities associated with the started `ptool` process, by copying and completing the following table:

	real	effective	saved
user ID			
group ID			
supplementary groups			

[4 marks]

(ii) Which values is the `ptool` process permitted to provide in the `seteuid()` system call? [2 marks]

(c) Microsoft’s Active Directory Domain Service stores information about users and computers in an LDAP object tree. It controls access to such objects using an extension of the access-control list mechanism also used for Windows NTFS files. What additional field does Active Directory ACEs use compared to NTFS ACEs and what is its purpose? [2 marks]