



UNIVERSITY
of
GREENWICH

EXAMINATION PAPER: ACADEMIC SESSION 2014/15

Campus Maritime Greenwich

Faculty Architecture, Computing and Humanities

Department Computing and Information Systems

Level 5

TITLE OF PAPER Operating Systems

COURSE CODE COMP 1562

Date and Time May 2015 - 2 hours

Answer any **TWO** of the following **THREE** questions.

Each question is worth 50 marks.

If you answer more than two questions, marks will **ONLY** be awarded for your **TWO** best answers.

APPROVED CALCULATORS ARE PERMITTED
OTHER ELECTRONIC DEVICES ARE **NOT** PERMITTED

1. (a) With the aid of diagrams compare and contrast systems with and without interrupts.

[12 marks]

[Up to [4 marks] for explaining what the /etc/fstab file is used for and up to [9 marks] for explaining each line to a maximum of [14 marks]]

- (b) You have been presented with the following contents of the **/etc/fstab** file. Explain what the file is used for and what each of the lines 1-3 means.

```
[root@localhost ~]# cat /etc/fstab
#
# /etc/fstab
# Created by anaconda on Tue Aug 26 15:20:48 2014
#
# Accessible filesystems, by reference, are maintained under '/dev/disk'
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info
#
1 /dev/mapper/centos-root / xfs defaults 1 1
2 UUID=def2a5e0-3aff-44e0-a4bf-a45a89c59e8f /boot xfs defaults 1 2
3 /dev/mapper/centos-swap swap swap defaults 0 0
[root@localhost ~]# _
```

[14 marks]

[Up to [15 marks] for a reasonable explanation and up to [15 marks] for appropriate examples to a maximum of [24 marks]]

- (c) Suppose you are employed as senior Linux system administrator in an organization and you decided that part of the administrator work could be done by your two co-administrators. Ideally, you would like them to help you with groups and users management but you don't want to reveal root password to them. Describe TWO alternative ways of achieving this. Wherever possible provide implementation examples.

[24 marks]

[Up to [15 marks] for a reasonable explanation and up to [15 marks] for appropriate examples to a maximum of [24 marks]]

2. (a) Compare and contrast **processes** and **threads** from the point of view of their handling and programming. Wherever possible provide implementation examples. **[12 marks]**

[Up to [10 marks] for describing threads and processes specifics and up to [8 marks] for implementation examples to a maximum of [12 marks]]

- (b) You are presented with the screenshot below. Explain in detail what each of the lines 1-8 means.

```
1 [root@localhost ~]# last
2 root      tty2                                Wed Aug 27 12:22      still logged in
3 (unknown  :0                                Wed Aug 27 12:18      still logged in
4 reboot    system boot  3.10.0-123.el7.x   Wed Aug 27 12:18 - 06:47 (1+18:29)
5 root      tty2                                Wed Aug 27 12:17 - 12:17 (00:00)
6 root      tty2                                Wed Aug 27 12:17 - 12:17 (00:00)
7 root      tty3                                Wed Aug 27 11:59 - down (00:18)
8 root      tty2                                Wed Aug 27 07:22 - 12:17 (04:54)
```

[14 marks]

[Up to [8 marks] for each line to a maximum of [14 marks]]

- (c) The target system you develop a printer driver for does not support any kind of synchronisation mechanism. You know that in this situation the only solution is to incorporate this kind of synchronisation mechanism into the driver itself to prevent the printer users from printing issues. Describe how the part of the driver implementing code might look like. Using any programming language or pseudo-code detail how you would achieve this.

[24 marks]

[Up to [10 marks] for a correct processes placement plus up to [20 marks] for correctly drafted program to a maximum of 24 marks]

3. (a) With the aid of diagrams, explain **context switching** in operating systems. Illustrate your explanation with a fragment of code or pseudo code and indicate where exactly the context switching would take place if the code were part of an executing program.

[12 marks]

[Up to [8 marks] for explaining the context switching and up to [8 marks] for addressing the problem of showing the fragment of code to a maximum of [12 marks]]

- (b) You were presented with the screenshot below. Explain in detail what each of the lines 1-8 means.

```
1 [root@localhost ~]# df
2 Filesystem            1K-blocks    Used Available Use% Mounted on
3 /dev/mapper/centos-root 29321228 5231416  24089812  18% /
4 devtmpfs                370996         0    370996    0% /dev
5 tmpfs                   380104         0    380024    1% /dev/shm
6 tmpfs                   380104    10196    369908    3% /run
7 tmpfs                   380104         0    380104    0% /sys/fs/cgroup
8 /dev/sda1               508588   120580    388008   24% /boot
9 [root@localhost ~]# _
```

[14 marks]

[Up to [5 marks] are available for explaining each line to a maximum of [14 marks]]

- (c) Consider the three processes listed below with their arrival time and service time to be AT and ST respectively.

P1: AT=0ms, ST=3ms

P2: AT=2ms, ST=7ms

P3: AT=4ms, ST=5ms

- (i) Draw Gantt charts and calculate the average waiting time T_A and average turnaround time T_T for each of the two following scheduling algorithms:

- Preemptive version of Shortest Job Next
- Non-preemptive version of Shortest Job Next

[16 marks]

- (ii) Based on the performance index J_x expressed as:

$$J_x = 0.3T_A + 0.7T_T$$

state which of the two scheduling algorithms is more efficient (guarantees better performance meant by lower value of the performance index).

[8 marks]

[Marking scheme for this question is as follows: 6 marks for each Gantt chart (in total of 12 marks)], 4 marks for calculating T_A and T_B for each algorithm (in total of 8 marks), 2 marks for calculating J_x for each algorithm (in total of 4 marks)]