APPROVED

UNIVERSITY *of* GREENWICH

EXAMINATION PAPER:	ACADEMIC SESSION 2014/15
Campus	Maritime Greenwich
Faculty	Architecture, Computing and Humanities
Department	Computing & Information Systems
Level	5
TITLE OF PAPER	Operating Systems
COURSE CODE	COMP 1562
Date and Time	July 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 explain what is **internal** and **external** memory partitioning.

[12 marks]

(b) You are presented with the screenshot below showing the contents of /etc/rsyslogd.conf file. Explain in detail what each of the lines 1-8 means.

```
1 #kern.*                                                 /dev/console
2 *.info;mail.none;authpriv.none;cron.none                /var/log/messages
3 authpriv.*                                              /var/log/secure
4 mail.*                                                  -/var/log/maillog
5 cron.*                                                  /var/log/cron
6 uucp,news.crit                                          /var/log/spooler
7 local7.*                                                /var/log/boot.log
```

[14 marks]

(c) You were applying for a Linux administrator job in an organisation. As part of the recruitment process you were asked to create a standard user account. You thought that this would not be a problem but it turned out that they were using a very customized distribution of Linux system very closely related to RedHat Linux, where the standard commands, like **useradd** / **userdel**, **groupadd** / **groupdel** were nowhere to be found neither, in the system nor in the default software repositories. Describe how you would add the standard user account in this situation. Wherever possible provide implementation examples.

[24 marks]

[Up to 15 marks for the explanation and up to 15 mark for examples to a maximum of 24 marks].

2.

(a) With the aid of diagrams, compare and contrast **monolithic** and **micro-kernel** architectures. Explain how you configure the Linux OS kernel so that it conforms one of these architectures.

[12 marks]

(b) The output returned by the Linux command:

```
cat /etc/security/limits.conf
```

is presented below. Line numbers have been added for convenience. Explain how the command works and explain each of the lines numbered 1-7.

```
1 *               soft    core            0
2 *               hard    rss             10000
3 @student        hard    nproc           20
4 @faculty        soft    nproc           20
5 @faculty        hard    nproc           50
6 ftp             hard    nproc           0
7 @student        -       maxlogins       4
  # End of file
  [root@localhost ~]# _
```

[14 marks]

(c) You are given the task of developing a program that would consolidate fragmented files in a system where chained files allocation method is used. Using pseudo-code or an appropriate programming language, detail how you would achieve this.

[24 marks]

[Up to 15 marks for using proper data structures and up to 15 marks for a code / pseudo code that reflects the algorithm specifics to a maximum of 24 marks]

3.

(a) With the aid of diagrams, describe memory overlaying technique and its limitations.

[12 marks]

(b) You are presented with the screenshot below. Explain in detail what each of the lines 1-10 means.

```
 1 top - 07:56:55 up 1 day, 16:44,  2 users,  load average: 0.01, 0.02, 0.05
 2 Tasks: 128 total,   2 running, 126 sleeping,   0 stopped,   0 zombie
 3 %Cpu(s):  0.3 us,  0.1 sy,  0.0 ni, 99.5 id,  0.0 wa,  0.0 hi,  0.0 si,  0.0 st
 4 KiB Mem:    760208 total,   642516 used,   117692 free,      440 buffers
 5 KiB Swap:  1605628 total,      848 used,  1604780 free.   202052 cached Mem
 6
 7   PID USER      PR  NI    VIRT    RES    SHR S %CPU %MEM     TIME+ COMMAND
 8 11192 root      20   0  123524   1476   1044 R  5.5  0.2   0:00.04 top
 9     1 root      20   0   52840   6768   3768 S  0.0  0.9   0:05.02 systemd
10     2 root      20   0       0      0      0 S  0.0  0.0   0:00.02 kthreadd
```

[14 marks]

(c) At a given time there are the following gaps in the memory allocation (in memory order): 15k, 9k, 32k, 10k, 17k, 21k and 45k. The next process requests 30k of memory and is allocated to the 32k gap, as shown in the diagram below.

Copy and complete the table below to show the memory allocation after the next six successive process requests of 10k, 14k, 3k, 20k, 15k and 8k using each of the four placement algorithms First Fit, Next Fit, Best Fit and Worst Fit.

Memory Gap	*First Fit*	*Next Fit*	*Best Fit*	*Worst Fit*
15k				
9k				
32k	*30k*	*30k*	*30k*	*30k*
10k				
17k				
21k				
45k				

[1 mark for each correct placement]

[24 marks]