

**The University of Queensland
School of Information Technology and Electrical Engineering
Semester 1, 2009**

COMP2303 COMP7306

SAMPLE MID-SEMESTER EXAM

There are **20 questions**. All questions are worth one (1) mark.
Time: **45 minutes** for working. No perusal time.

Instructions

1. Do not open this question booklet until instructed to do so by the exam supervisor.
2. Answers are to be filled-in on the supplied "True/False and Multiple Choice Answer Sheet". Read the instructions on the answer sheet before you begin.
3. Choose the answer which **best** answers the question or completes the statement.
4. Correct answers will be awarded one mark. Incorrect, missing or multiple answers will be worth zero marks.
5. Class tests will be conducted in accordance with the University's Assessment Rules. You must comply with these rules and **all** directions given by exam supervisors.
6. You must maintain complete silence. During the course of the test you shall not communicate in any way with any other person except a supervisor or examiner. To make such communication you should raise your hand.
7. The test is "open book". You may bring any written or printed material in to the room. You may also bring a battery-operated or solar-powered calculator. Other computing or communication devices are NOT permitted.
8. **You must write your name (Surname and Initials) and student number on the answer sheet and you must mark the corresponding ovals. You must also complete and sign the form below.** Failure to complete the form and sign this question paper will result in a mark of zero for this test.

You must complete the following form **and** complete the required details on the answer sheet.

Last Name:											
Given Names:											
Student Number:	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> <td style="width: 12.5%;"></td> </tr> </table>										
Regular Signature:											
Test ID:	Sample										

- ➔ Enter this in the Surname section of the answer sheet and **shade the corresponding ovals.**
- ➔ Enter your initials on the answer sheet and **shade the corresponding ovals**
- ➔ Enter your student number on the answer sheet and **shade the corresponding ovals.**

COURSE CODE:

DATE:

Fill in these squares on the answer sheet

SURNAME														
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
G	G	G	G	G	G	G	G	G	G	G	G	G	G	G

INITIALS
○
A
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STUDENT NUMBER									
0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7

EXAMINER USE ONLY				
A1	A2	A3	A4	A5
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7

1. Consider the following C code fragment:

```
int a,b,c;  
  
a=1;  
b=3;  
c=20;  
c /= ++b + a++;
```

What is the value of `c` after the execution of this code fragment?

- (a) 4
 - (b) 5
 - (c) 6
 - (d) 7
 - (e) None of the above
2. Consider the code fragment in Question 1, above. What are the values of `a` and `b` after the execution of this code fragment?
- (a) `a` is 1 and `b` is 3
 - (b) `a` is 2 and `b` is 3
 - (c) `a` is 1 and `b` is 4
 - (d) `a` is 2 and `b` is 4
 - (e) None of the above
3. Consider the following C code fragment:

```
char c[] = "comp2303";  
char *p;
```

```
p = c+2;
```

Which of the following expressions is false?

- (a) `strlen(&c[7])`
 - (b) `*(p+6)`
 - (c) `p[1] == 'p'`
 - (d) `c[6]`
 - (e) None of the above
- The following applies to questions 4, 5 and 6:
A computer system requires natural alignment and items of type character, short, int, long, float, double and pointers occupy 1, 2, 4, 8, 4, 8 and 8 bytes respectively.
4. What is the result of `sizeof(struct {short s; int i; double d; char c;})`?
- (a) 16
 - (b) 20
 - (c) 24
 - (d) 32
 - (e) None of the above
5. What is the result of `sizeof(struct {char* names[2]; double cost; int count;})`?
- (a) 16
 - (b) 20
 - (c) 24
 - (d) 32
 - (e) None of the above

6. What is the result of `sizeof(struct {union {char c; int i;} u; float f[3]; struct{ char c[2]; float f[2]; } s;})` ?
- (a) 24
 (b) 28
 (c) 32
 (d) 36
 (e) 40

7. Consider the following C program:

```
#include <stdio.h>
int main(int argc, char* argv[])
{
    int recurse = 0;
    int all = 0;
    argc--;
    while(argc) {
        if(argv[argc][0] == '-') {
            switch(argv[argc][1]) {
                case 'a':
                    all = argc;
                    break;
                case 'r':
                    recurse = 1;
                    break;
                default:
                    printf("Invalid argument: %s\n", argv[argc]);
            }
        } else {
            printf("%s\n", argv[argc]);
        }
        argc--;
    }
    return argc + all;
}
```

If the program is compiled to an executable called `a.out` in the current directory, what will be printed as a result of running

`./a.out -ab c -r d`

- (a) d
 c
 Invalid argument: -ab
 ./a.out
- (b) Invalid argument: -ab
 c
 d
- (c) c
 d
- (d) d
 c
 ./a.out
- (e) None of the above

8. Consider the program shown in Question 7. What is the exit status of the program as a result of running

`./a.out -r -a b c d`

- (a) 0
 (b) 2
 (c) 5
 (d) 7
 (e) None of the above

9. Consider the program shown in Question 7. What is the exit status of the program as a result of running

```
./a.out b c d -a -r -a
```

- (a) 0
 (b) 3
 (c) 4
 (d) 10
 (e) None of the above
10. Which of the following best describes the type of `var` in the following declaration?
`char *(*var)()`
- (a) A pointer to a function taking no arguments and returning a string
 (b) A pointer to a function taking any number of arguments and returning a character
 (c) A pointer to a function taking any number of arguments and returning a string
 (d) A pointer to a pointer to a function taking no arguments and returning a character
 (e) A pointer to a pointer to a function taking any number of arguments and returning a character
11. Which of the following declarations of `var` is a pointer to a function which returns nothing and takes two arguments – the first of which is a pointer to a function taking an integer and returning an integer, and the second of which is a integer?
- (a) `void var(int*(int), int);`
 (b) `void *var(int (*)(int), int);`
 (c) `int (*var)(int*(int), int);`
 (d) `void (*var)(int (*)(int), int*);`
 (e) None of the above
12. Consider the following structure definitions and variable declarations:
- ```
struct Point {
 double x, y;
};
struct Triangle {
 struct Point vertex[3];
};

struct Triangle t;
struct Point *p;
```
- and the following associated statements:
- ```
p = (struct Point*)&t;
t.vertex[0].x = 1.0;
t.vertex[0].y = 5.0;
t.vertex[1].x = 10.0;
t.vertex[1].y = 10.0;
t.vertex[2].x = 5.0;
t.vertex[2].y = 10.0;
```
- Which of the following expressions is both valid and true?
- (a) `p->x == p->y`
 (b) `*(p + 1) == &t.vertex[0].y`
 (c) `t.vertex[0] == p->x`
 (d) `t.vertex[2].x == p->y`
 (e) None of the above

13. Consider the structure definitions from Question 12 and the following function:

```
char* point_to_text(struct Point* pt) {
    char* str;
    str = (char*)malloc(...);
    sprintf(str, "(%g, %g)", pt->x, pt->y);
    return str;
}
```

Note that the %g format specifier for sprintf, will print a double precision floating point number using no more than 14 characters.

What value should be placed at ... so that the memory allocated is exactly that required?

- (a) 9
 - (b) 28
 - (c) 29
 - (d) 33
 - (e) 34
14. Consider the following commands and output from a shell session (the commands typed by the user are shown in **bold**):

```
> pwd
/students/39/comp2303
> ls -al
total 19
drwxrwx--x  4 comp2303  comp2303      512 Apr  6 21:50 .
drwxr-xr-x  57 root      sysadm        1536 Apr  6 16:05 ..
-rw-----  1 comp2303  comp2303      153 Mar 16 20:00 .Xauthority
-rw-----  1 comp2303  comp2303      782 Mar 16 20:04 .bash_history
-rw-----  1 peters    comp2303       13 Apr 14 12:01 .exrc
drwxrwx--x 239 peters    comp2303    11264 Apr  6 13:37 a1
drwxrwxr-x  3 peters    comp2303     512 Apr  7 09:02 a2
drwx-----  2 peters    comp2303     512 Apr 14 11:24 a3
lrwxrwxrwx  1 peters    comp2303       2 Apr 15 12:38 assign3 -> a3
```

The only member of the 'comp2303' group is user 'peters'.

Which of the following statements is true?

- (a) There are 56 subdirectories in /students/39
 - (b) User 'comp2303' may create new directories in /students/39/comp2303/a3
 - (c) Any user can read the contents of all of the files in /students/39/comp2303/a2
 - (d) Any user can list the names of the files in /students/39/comp2303/a1
 - (e) None of the above
15. Consider the scenario of question 14 where user 'peters' then executes

```
cd /students/39/comp2303
chmod 705 a3
ls -l
```

What permissions will be listed for a3?

- (a) drwx-----
- (b) drwx----wx
- (c) drwx---r-x
- (d) -rwx---r-x
- (e) -r-x---rwx

16. If the current directory is `/var/tmp`, which of the following path names is equivalent to `/tmp/tmp`?
- (a) `../tmp/tmp`
 - (b) `../../tmp/./tmp`
 - (c) `../tmp/..tmp`
 - (d) `/tmp/..var/..tmp`
 - (e) None of the above
17. The following is output from “`ls -il`”. Which of the following is false?
- ```
7528153 -rw-r--r-- 2 fred users 14 Apr 3 12:21 x
7528153 -rw-r--r-- 2 fred users 14 Apr 3 12:21 y
7527609 lrwxrwxrwx 1 fred users 1 Apr 3 12:19 z -> y
```
- (a) The contents of x and y are the same
  - (b) z is a symbolic link to y
  - (c) If y is deleted, z can not be opened
  - (d) Deleting x will increase the number of free disk blocks on the system
  - (e) None of the above is false

For questions 18 and 19, consider a UNIX file system with a disk block size of 8 kbytes which uses i-nodes with double-indirect. Each disk block pointer is 4 bytes long and the i-node contains 14 block pointers in total (12 direct block pointers, one single indirect, one double indirect).

18. What's the largest file that can be stored without using the double-indirect block pointer?
- (a) 8192 kbytes
  - (b) 8240 kbytes
  - (c) 8288 kbytes
  - (d) 16480 kbytes
  - (e) None of the above
19. The file system is formatted such that it has 1,033,400 disk blocks and 500,864 i-nodes. Ignoring any usage of disk blocks for directory indexes, what is the maximum number of 20 kbyte files that can be stored on the file system?
- (a) 344,466
  - (b) 344,467
  - (c) 413,360
  - (d) 500,864
  - (e) 1,033,400
20. Consider a virtual memory system which uses two-level page tables, with a page size of 8 kbytes and a page table entry (PTE) size of 4 bytes, What's the maximum amount of memory a process can use before a second level-two page table is needed? (Page tables at each level occupy a full page.)
- (a) 8 Mbytes
  - (b) 16 Mbytes
  - (c) 32 Mbytes
  - (d) 64 Mbytes
  - (e) None of the above

**END OF PAPER**