



University College Dublin
An Coláiste Ollscoile, Baile Átha Cliath

SEMESTER 2 EXAMINATION – 2012/2013

COMP 10060

Computer Science for Engineers I

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Time allowed: 2 hours

Instructions for candidates

Answer **Question 1** and **one** other Question.
Question 1 carries 60 marks; Questions 2 and 3 carry 40 marks.

This is a closed-book examination. No calculators allowed.

Instructions for Invigilators

This is a closed-book examination. No calculators allowed.

Loose Rough Work sheets are not to be distributed or used.

READ EACH QUESTION CAREFULLY.

Question 1 (COMPULSORY) [60 marks]

Answer all parts (a) – (t). Each part carries 3 marks.

No explanation required for any part of Q1

- (a) What is the screen output of the following fragment of C code?

```
int i = 1;
int somearray[] = {3,7,4,6,8};
for (i = 0; i <= 3; i++){
    printf("Element number %d is %d\n", i,
somearray[i]);
}
```

- (b) What is the screen output of the following fragment of C code?

```
int count(int A[], int size, int target) {
    int n = 0, i;
    for (i=0; i<size; i++) {if (A[i]==target)
{n++;}}
    return n;
}

void main()
{
int name[]={5,6,5,3,2,5,6,7,8,2,1,3,4,2,5,4,2};
int result=0;
result = count(name,10,2);
printf("Output is \n%d ", result);
}
```

- (c) What is the screen output of the following fragment of C code?

```
int i;
for (i=5;i>1;i--){
    switch(i){
        case 1:    printf("1");
        case 3:    printf("3\n");
                    break;
        case 4:    printf("4");
        case 5:    printf("5\n");
        default:   printf("default\n");
    }
}
```

- (d) What is the screen output of the following fragment of C code?

```
int a=2, b=-1, c=0;
if (a||b&&c){
    printf("Yes\n");
} else {
    printf("No\n");
}
```

- (e) What is the screen output of the following fragment of C code?

```
int j=-10, y;
y = ! ! j;
printf("y is %d\n",y);
```

- (f) What is the screen output of the following fragment of C code?

```
int nstars = 7, stars;
while (nstars >= 2) {
    stars = 2;
    while (stars <= nstars) {
        printf("+");
        stars++;
    }
    printf("\n");
    nstars--;
    nstars--;
}
```

- (g) What is the screen output of the following fragment of C code?

```
int i=-8,j=-i;
if (i>=-10){
    printf("first\n");
} else if ((-i)<=(-j)){
    printf("second\n");
} else {
    printf("no match\n");
}
```

- (h) What is the screen output of the following fragment of C code?

```
double x=42.551;
printf("value is \t+%.1f\n",x);
```

- (i) Suppose that x, y, z and w are all of type int. If the initial value of w is 30, x is 20, y is 3, and z is 2, what is the final value of w in the following expression?

```
w += x / y + y * z - w
```

- (j) What is the screen output of the following fragment of C code?

```
float number = 435.73810, new ;
new = ((int)(100*number))/100.0 ;
printf("number is %7.3f\n",new);
```

- (k) What is the screen output of the following fragment of C code?

```
int i=0,j=50;
for (i=6;i>2;i--){
    j/=i;
    printf("j is %d\n",j);
}
```

- (l) What is the screen output of the following fragment of C code?

```
double x=3.142;
printf("value is %9.f",x);
```

- (m) What is the screen output of the following fragment of C code?

```
int i=10;
while (i>1){
    i -= 2;
    printf("i is %d\n",i/2);
}
```

- (n) What is the screen output of the following fragment of C code?

```
#include <stdio.h>
int f1(int a, int b, int c){
    return (c);
}
int f2(int a, int b){
    int c = f1(a, b, 3);
    return c+10;
}
void main()
{
    printf("result is %d\n", f1(-1,f2(2,4),2));
}
```

- (o) What is the screen output of the following fragment of C code?

```
int x = +2;
int y = -3;
int* p = &x;
*p = (*p)*x - (*p)*y;
printf("x is %d and y is %d\n", x, y);
```

- (p) What is the screen output of the following fragment of C code?

```
char str[]="abcdefghijklmn";
char wanted[]="aeiou";
int i, j;
for (j=1; wanted[j]!='\0'; j++){
    for (i=1; str[i]!='\0'; i++){
        if (str[i]==wanted[j]){
            str[i]='X';
            break;
        }
    }
}
printf("string=%s\n", str);
```

- (q) What is the screen output of the following fragment of C code?

```
struct Address {
    int number;
    char street[20];
    char city[20];
};

struct Employee {
    int number;
    char name[30];
    int age;
    char position[30];
    struct Address addr;
};

void main() {
    struct Employee emp;
    emp.number = 22;
    emp.addr.number = 56;
    printf("output is %d\n", emp);
}
```

- (r) What is the screen output of the following fragment of C code? The initial values in datafile.txt are:

0.2 80
0.7 60
0.1 50

```
float prob, avg=0.0;
int quantity, num_values=0;
FILE *fptr;
fptr=fopen("datafile.txt", "r");
while(fscanf(fptr, " %f %d", &prob, &quantity)==2){
/* if return value from this fscanf() is not 2, */
/* the end-of-file indicator has been reached */
avg = avg + (prob*quantity);
}
fclose(fptr);
printf("Average is %.4f\n", avg);
```

- (s) What are the contents of datafile.txt after the execution of this fragment of code? The initial values in datafile.txt are:

200
-54

```
int var1, var2;
FILE *fp;
FILE *fptr;
fp=fopen("datafile.txt", "r");
fscanf(fp, "%d %d", &var1, &var2);
fclose(fp);
fptr=fopen("datafile.txt", "w");
fprintf(fptr, "%d\n%d", var2, var1);
fclose(fptr);
```

- (t) What is the screen output of the following fragment of C code?

```
double x=393.59;
printf("value is %+.3E",x);
```

Question 2 [40 Marks]

Answer all four (4) parts

- (a) Write a program that uses a function **convert()** to determine the equivalent number of years, months, weeks, and days for a given time in days. You can assume that there are 365 days in each year, and 30 days in each month. For example 3,661 days is equivalent to 10 years, 0 months, 1 week and 4 days. Use the following function prototype:

```
void convert(int days, int *pyrs, int *pmths, int *pwks,
int *pdays);
```

Remember to use good programming standards, define the problem statement, show the design of the program, add comments to the code, and follow good formatting practices to lay out the code. Your answer should include the algorithm design and the code.

[10 Marks]

- (b) Consider the following C program:

```
#include <stdio.h>
void main(void)
{
    int intarr[3], i;
    for (i=0 ; i<3; i++){
        printf("enter value number %d: ", i+1);
        scanf("%d", &intarr[i]);
        printf("you entered %d\n", intarr[i]);
    }
}
```

Re-write the program using “array pointers” instead of array subscripts.

[10 Marks]

- (c) Consider the following C program:

```
#include "stdio.h"
void main(void){
    char message[80]="hello again";
    int count=0;
    while (message[count]!='\0'){
        count++; /* increase by 1 as long as NULL not reached */
    }
    printf("\"%s\" has width %d\n", message, count);
}
```

What is the screen output of this program (*no explanation required*) and *re-write* the above program so that all the code for determining the length of the string **message** is contained in a function called **stringlength()** that you should define.

[10 Marks]

Question 2 cont...

(d) Write a program to compute the received Doppler frequency of a radar echo for a target moving towards the transmitter at velocities ranging from 0.5 meters per second to 5 meters per second in 0.5 meters per second steps. The received Doppler frequency **Fr** is given by:

$$(F_r - F_t)/F_t = 2V/c$$

Where V is the velocity in meters per second

$F_t = 5.5$ GHz the transmitted frequency

$c = 3 \times 10^8$ meters per second

Remember to use good programming standards, define the problem statement, show the design of the program, add comments to the code, and follow good formatting practices to lay out the code. Your answer should include the algorithm design and the code.

[10 Marks]

Question 3 [40 marks]

Answer all four (4) parts

(a) Consider the following C program:

```
#include <stdio.h>
void main()
{
    FILE *f_ptr_in, *f_ptr_out;
    int inp, value = 8;
    f_ptr_in = fopen("data.dat", "r");
    f_ptr_out = fopen("output.dat", "w");
    while (fscanf(f_ptr_in, "%d", &inp) == 1) {
        if (inp < value && inp > -value) {
            fprintf(f_ptr_out, "%d\n", inp);
        } else
            fprintf(f_ptr_out, "Too much\n");
    }
    fclose(f_ptr_in);
    fclose(f_ptr_out);
}
```

Suppose the file **data.dat** contains the following data:

0
12
-13
9
33
-8
2
-4

After executing this program, what does the file **output.dat** contain?

[10 Marks]

Question 3 continued

(b) Consider the C program shown in (a) and re-write that program so that it writes all the negative values in the file **data.dat** to a file called **output2.dat**.

[10 Marks]

(c) Consider the following C program:

```
#include "stdio.h"
void main(void) {
    char message[80]="I really like programming a lot";
    int i=0, count=0;
    while (message[i]!='\0') {
        if ((message[i]=='a') || (message[i]=='A')) {
            count++;
        }
        i++;
    }
    printf("\n%s" contains %d a's\n", message, count);
}
```

Re-write the above program so that all the code for determining the number of **a**'s in the string **message** is contained in a function called **a_counter()** that you should define, while the declaration and initialization of **message** and the output is still done from **main()**.

[10 Marks]

(d) The following fragment of C code determines the type of fuel **f** using **if/else-if/else** statements:

```
char f;
/* value is entered for f - code not shown */
if (f=='u') {
    printf("unleaded petrol\n");
} else if (f=='p') {
    printf("eco petrol\n");
} else if (f=='d') {
    printf("diesel\n");
} else if (f=='g') {
    printf("gas\n");
} else printf("incorrect value entered\n");
```

Re-write this code fragment using a **switch** statement instead of the **if/else-if/else** statements.

[10 Marks]