KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS
Information and Computer Science Department

2011/2012 Spring Semester (Term 112)
ICS103 Computer Programming in C (2-3-3)

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FINAL EXAM
THURSDAY, 17 MAY 2012, 07:30 AM
120 MINUTES

Student's Information

Name:	Key Solution

KFUPM ID:									

Lec. Serial:	

Section:	

Abdulla Al-Sukairy	☐ 05 (UT 01pm)	☐ 10 (UT 10am)	☐ 14 (UT 11am)
Adil Al-Suhaim	☐ 20 (SM 07am)	☐ 24 (SM 08am)	☐ 28 (SM 11am)
Ahmed Al-Mulhem	☐ 09 (UT 10am)	☐ 13 (UT 11am)	☐ 22 (UT 08am)
Ali Al-Yousef	☐ 17 (UT 07am)	☐ 19 (UT 08am)	☐ 23 (UT 09am)
Amin Al-Hashim	☐ 01 (UT 07am)	☐ 03 (UT 09am)	☐ 07 (UT 08am)
El-Sayed El-Alfy	☐ 12 (SM 10am)	☐ 16 (SM 11am)	
Emad Ramadan	☐ 21 (UT 09am)	☐ 25 (UT 10am)	
M Balah	☐ 18 (UT 07am)		
Mohammad Al-Mulhem	☐ 04 (SM 09am)	☐ 11 (SM 10am)	
Mohammad Felemban	☐ 27 (UT 07am)		
Nasir Al-Darwish	☐ 06 (SM 01pm)	☐ 15 (SM 11am)	☐ 26 (SM 09am)
Rafi Ul Hasan	☐ 02 (SM 09am)	☐ 08 (SM 01pm)	

IMPORTANT NOTES

△ Fill-in your information above.

△ Do NOT start the exam until you are instructed to do so.

△ This is a close material exam. So, remove any relevant material.

△ Calculators are NOT allowed. If you have one, put it on the ground.

△ Mobile phones are NOT allowed. If you have one, switch it off NOW.

△ **Questions are NOT allowed after the first 20 minutes.**

△ **You are NOT allowed to leave the testing hall at the last 15 minutes. Remain seated and wait for instructions.**

△ Make sure you have **14** questions and **17** pages including this page.

△ Write clearly, briefly, and precisely.

Scored Marks

Question No.	Max. Mark	Score
01	4	
02	6	
03	5	
04	18	
05	6	
06	4	
07	5	
08	6	
09	4	
10	5	
11	6	
12	6	
13	13	
14	12	
TOTAL	100	

Good Luck!

QUESTION 01 (4 POINTS)

What will be printed by the following program?

| ```c
#include <stdio.h>

int main(void)
{
  int i, j = 1;

  do {
    for(i=5; i>j; i=i-2)
      printf("%d\n", i+j);
    printf("%d\n", i);
    j = j + 3;
  } while(j<4);
  printf("%d\n", j);

  system("pause");
  return 0;
}
``` | **6**<br>**4**<br>**1**<br>**4**<br><br>**1 point each** |

QUESTION 02 (6 POINTS)

What will be printed by the following program?

| ```c
#include <stdio.h>

int main(void)
{
  int i, j, sum;

  for(i=0; i<5; i++) {
    sum = 0;
    for(j=0; j<7; j++) {
      if(j%2==0 || j%3==0)
        continue;
      sum += i*j;
    }
    printf("%d\n", sum);
    if(sum>10)
      break;
  }

  system("pause");
  return 0;
}
``` | **0**<br>**6**<br>**12**<br><br>**2 points each** |

QUESTION 03 (5 POINTS)

What will be printed the following program for each given input? Use -1 to indicate negative result and 1 to indicate positive result. You may use the ASCII table provided at the end of the booklet.

```c
#include <stdio.h>
#include <string.h>

int main (void)
{
  char x[80];
  char y[80];
  gets(x);
  gets(y);
  printf("%d", strcmp(x,y));

  system("pause");
  return 0;
}
```

Run #	Input for x	Input for y	Output
1	Salam	Salam Shabab	-1
2	Salam	salam	-1
3	Salam	Hi	1
4	Salam	SaLaM	1
5	Salam	Salam	0

QUESTION 04 (18 POINTS)

PART I (3 POINTS)

Consider the following function:

```c
int fun(int x, double y) {
  return (x + y)/2;
}
```

Assume the following declaration and initialization statements:

```c
int n = 2, k;
double m = 9.5;
```

Which one of the following statements calls the above function correctly?

a	k = int fun(int m, int n);
b	int fun(m, n);
c	k = fun(int n, int m);
d	k = fun(n, m);
e	fun(m, n);

PART II (3 POINTS)

Assume the following declaration and initialization statements:

```
int x, y, z;
x = 3;
```

Assume a function with the following header exists:

```
void rem(int x, int *y, int *z)
```

Which one of the following statements calls the above function correctly?

a	void rem(int x, int &y, int &z);
b	rem(int x, int &y, int &z);
c	void rem(x, &y, &z);
d	rem(int x, int &y, int &z);
e	**rem(x, &y, &z);**

PART III (3 POINTS)

What will be printed by the following program? (Circle the correct answer)

```
#include <stdio.h>

int stn(int a);

int main(void)
{
  printf("%d", stn(stn(3)));

  system("pause");
  return 0;
}

int stn(int a)
{
  return 2*a;
}
```

a	12
b	6
c	9
d	3
e	run time error

Part IV (3 points)

What will be printed by the following program? (Circle the correct answer)

```c
#include <stdio.h>

int chk(int x, int y, int z);

int main(void)
{
  if(chk(10, 15, 15)) printf("%d ", 1);
  if(chk(15, 10, 15)) printf("%d ", 2);
  if(chk(20, 15, 10)) printf("%d ", 3);
  if(chk(10, 15, 20)) printf("%d ", 4);

  system("pause");
  return 0;
}

int chk(int x, int y, int z)
{
  return x<y && y<z;
}
```

a	1
b	4
c	3
d	2
e	no value printed

Part V (3 points)

What will be printed by the following program? (Circle the correct answer)

```c
#include <stdio.h>

int main(void)
{
  int a = 1, b = 2, c = 3, *p1, *p2;

  p1 = &a;
  p2 = &c;
  *p1 = a + 2;
  *p2 = a + 3;
  b = a + c;
  printf("%d  %d  %d", a, b, c );

  system("pause");
  return 0;
}
```

a	3	4	6
b	3	6	9
c	3	9	6
d	3	4	4
e	3	9	4

PART VI (3 POINTS)

What will be printed by the following program? (Circle the correct answer)

```c
#include <stdio.h>

int rec(int n);

int main(void)
{
  printf("%d", rec(3));

  system("pause");
  return 0;
}

int rec(int n)
{
  if(n==0)
    return 0;
  else
    return n + rec(n-2);
}
```

a	3
b	0
c	4
d	5
e	run time error (infinite recursion)

QUESTION 05 (6 POINTS)

What will be printed by the following program?

```c
#include <stdio.h>

int main(void)
{
  int a[7], j, k, b[] = {36,49,70};

  a[0] = 53;
  a[2] = 45;
  a[4] = 34;
  a[6] = 19;
  for(k=0; k<3; k++) {
    for (j=0; j<5; j=j+2) {
      if(b[k]>=a[j]) {
        a[j+1] = b[k];
        b[k] = a[j];
        break;
      }
    }
  }
  printf("%d  %d  %d\n", a[1], a[3], a[5]);
  printf("%d  %d  %d\n", b[0], b[1], b[2]);

  system("pause");
  return 0;
}
```

70   49   36
34   45   53

1 point each

QUESTION 06 (4 POINTS)

What will be printed by the following program?

```c
#include <stdio.h>
#define SIZE 10

int fun(int n);

int main(void)
{
  int a[SIZE] = {3,4,8,9,1,16,5,12,11,6};
  int i, c1 = 0, c2 = 0;

  for(i=0; i<SIZE; ++i) {
    if(fun(a[i]))
      c1++;
    else
      c2++;
  }
  printf("%d\n", c1);
  printf("%d\n", c2);

  system("pause");
  return 0;
}

int fun(int n)
{
  return n%4==0;
}
```

4
6

2 points each

QUESTION 07 (5 POINTS)

What will be printed by the following program?

```c
#include <stdio.h>
#define SIZE  5

void fun1(int a[], int size);
void fun2(int a[], int size);

int main(void)
{
  int x[SIZE] = {6,3,9,1,4};
  int i;

  fun1(x, SIZE);
  fun2(x, SIZE);

  system("pause");
  return 0;
}

void fun1(int a[], int size)
{
  int i;

  for(i=0; i<size; ++i) {
    if(i%2==1)
      a[i] += 2;
    else
      a[i] *= 2;
  }
}

void fun2(int a[], int size)
{
  int i;

  for(i=0; i<size; ++i)
    printf("%d\n", a[i]);
}
```

12
5
18
3
8

1 point each

QUESTION 08 (6 POINTS)

What will be printed by the following program?

```c
#include <stdio.h>
#include <string.h>

int main(void)
{
  char m[][15] = {"Good#Morning",
                  "ICS#103",
                  "Students"};
  int i;

  for(i=0; i<3; i++)
    printf("%s  %d\n", m[i], strlen(m[i]));

  system("pause");
  return 0;
}
```

Good#Morning 12
ICS#103 7
Students 8

1 point each

QUESTION 09 (4 POINTS)

What will be printed by the following program?

```c
#include <stdio.h>
#include <string.h>

int main(void)
{
  char str[80] = "Colors:Red,Green,&Blue";
  char delims[] = ":,";
  char *token;

  token = strtok(str, delims);
  while(token!=NULL) {
    puts(token);
    token = strtok(NULL, delims);
  }

  system("pause");
  return 0;
}
```

Colors
Red
Green
&Blue

1 point each

QUESTION 10 (5 POINTS)

What will be printed by the following program?

```c
#include <stdio.h>

int main(void)
{
  int n[3][3] = {{1,1,1},{2,2,2},{3,3,3}};
  int i, j;

  for(i=0; i<3; i++){
    for(j=0; j<3; j++){
      if(abs(i-j)==1)
        n[i][j] *= 2;
      else
        n[i][j] = 0;
      printf("%d  ", n[i][j]);
    }
    printf("\n");
  }

  system("pause");
  return 0;
}
```


0   2   0
4   0   4
0   6   0

0.5 point each + 0.5 for format

QUESTION 11 (6 POINTS)

What will be printed by the following program?

```c
#include <stdio.h>
#define R 3
#define C 4

int main(void)
{
  int z[R][C] = {{1,10,26,0},
                 {2,51,13,8},
                 {6,11,21,4}};
  int i, j, m;

  for(j=0; j<C; j++) {
    m = z[0][j];
    for(i=1; i<R; i++) {
      if(z[i][j]>m)
        m = z[i][j];
    }
    printf ("%d\n", m);
  }

  system("pause");
  return 0;
}
```


6
51
26
8

1.5 points each

QUESTION 12 (6 POINTS)

Consider the following program:

```c
#include <stdio.h>

int main (void)
{
  int A[3][4], i, j;

  for(i=0; i<3; i++) {
    for(j=0; j<4; j++) {
      if(i==0)
        A[i][j] = j + 2;
      else if(i==1)
        A[i][j] = i*j;
      else
        A[i][j] = i/(j+1);
    }
  }

  system("pause");
  return 0;
}
```

What will be the content of matrix A after executing the above program?

A			
2	3	4	5
0	1	2	3
2	1	0	0

QUESTION 13 (13 POINTS)

Write ONLY a function, **findLetter**, that receives a string, **str**, and a character, **ch**, as arguments and returns the position of the first occurrence of **ch** in **str** or -1 if **ch** doesn't exist in **str**. *Use the proposed names for the arguments.*

```c
int findLetter(char str[], char ch) // 4 points (1+1+1+1)
{
    int i; // 1 point

    for(i=0; i<strlen(str); i++) // 4 points (syntax: 1, initial: 0.5, limit: 2; incr: 0.5)
        if(str[i] == ch) // 2 points (syntax: 0.5, condition: 1.5)
            return i;   // 1 point

    return -1; // 1 point
}
```

Complete the following function that receives a square integer matrix, **m**, and its size, **s**, as arguments and changes **m** into *diagonal matrix*. A matrix is called *diagonal matrix* if all elements outside the main diagonal are zero (see the figure below). In other words, the main diagonal elements of the original matrix are left unchanged and all the other elements are set to zero. **COL** is a constant set to 50.

1	0	0	0	0
0	9	0	0	0
0	0	2	0	0
0	0	0	5	0
0	0	0	0	5

main diagonal

An example of a diagonal matrix

```
void makeDiagonal(int m[][COL], int s)
{
    int i, j;  // 1 point (0.5/declared var.)

    for(i=0; i<s; i++)  // 4 points (syntax: 1, initial: 1, limit: 1; incr: 1)
        for(j=0; j<s; j++)  // 4 points (syntax: 1, initial: 1, limit: 1; incr: 1)
            if(i != j)  // 2 points (syntax: 0.5, condition: 1.5)
                m[i][j] = 0;  // 1 point
}
```

KEY SOLUTION

ASCII Table

Char	ASCII		Char	ASCII		Char	ASCII
\0	0		A	65		a	97
Space	32		B	66		b	98
#	35		C	67		c	99
$	36		D	68		d	100
%	37		E	69		e	101
&	38		F	70		f	102
'	39		G	71		g	103
(	40		H	72		h	104
)	41		I	73		i	105
*	42		J	74		j	106
+	43		K	75		k	107
,	44		L	76		l	108
-	45		M	77		m	109
.	46		N	78		n	110
/	47		O	79		o	111
0	48		P	80		p	112
1	49		Q	81		q	113
2	50		R	82		r	114
3	51		S	83		s	115
4	52		T	84		t	116
5	53		U	85		u	117
6	54		V	86		v	118
7	55		W	87		w	119
8	56		X	88		x	120
9	57		Y	89		y	121
:	58		Z	90		z	122
;	59		[	91		{	123
<	60		\	92		|	124
=	61		]	93		}	125
>	62		^	94		~	126
?	63		_	95		(del)	127

~ Scratch Paper ~
~ you may detach this paper from the exam booklet ~

KEY SOLUTION