1091 NTOUCSE 程式設計 1C 期中考

姓名：_____ 系級：_____ 學號：_____ 109/11/10 (二)

考試時間：**13:20 – 16:00**

Exam rules：1. **Close book**, **close** everything including quizs, homeworks, assignments, reference materials, etc.
2. You can answer the questions in **English** or in **Chinese**, in this **problem sheet**, the **answer sheet**, or **both**.
3. No computer or calculator is allowed. (Electronic) English dictionary is OK
4. No peeping around! No discussion! No exchange of any material; **raise your hand if you have any question about the exam problems**
5. If you turn in the paper earlier than the specified time, leave the classroom immediately and quietly
6. Against any of the above rules will be treated as cheating in the exam and handled by school regulations.
7. **Turn in BOTH the signed problem sheet and signed answer sheet**..

1. (a) [7]What are the outputs of the following program if compiled and executed?
   (b) [3]Which variable definitions do not conform to the syntax of ANSI C89 (which is most commonly supported by all C compilers)?
   (c) [5]Which variables are local variables? global variables? static variables?
   (d) [5]What are the scope and the lifetime of the variables defined in the 4-th and the 13-th lines respectively?

```
01 #include <stdio.h>
02 int a = 100;
03 int fun(int r) {
04         static int a = r;
05         return a = a+r;
06 }
07 int main() {
08         int b = 100;
09         {
10                 int a = 10;
11                 printf("%d ", a);
12         }
13         int c = fun(a);
14         printf("%d %d ", a, fun(a+5));
15         for (int a=0; a<2; a++) {
16                 char c = 'a';
17                 printf("%d %c ", a, c++);
18         }
19         return 0;
20 }
```

2. (a) [6] Please use parentheses and coerced type conversions to describe the underlying operations of CPU in evaluating the expression ch*s-d/f-(s+i/2) in line 2 below? (Note the ASCII code of 'a' is 97)
   (b) [4] What is the output of line 2?

```
01 char ch='a'; short s=2; int i=3; float f=2.0f; double d=6.28;
02 printf("%.2f\n", ch*s-d/f-(s+i/2));
```

3. [5] Please complete the following function for determining whether a long long integer n is a power of 3? Return 1 if yes and 0 otherwise.

```
01  int isPowerOf3(long long n) {
02        if (n==0) return 0;
03        while ( ______%3==0 ) _______
```

```
04      return _____;
05  }
```

4. (a) [5] What are the corresponding lengths (in unit of bytes) and the initial contents of the following three types of array definition/initialization?
   ① char str[] = {'j', 'o', 'e'}; ② char str[4] = {'j', 'o', 'e'}; ③char str[] = "joe";
   (b) [5] What are the outputs of the third line below corresponding to these three array definitions?
   (c) [5] Which one is likely to give out unpredicted outputs for the fourth line of the following program? (Please elaborate the reason of this behavior?)

```
01. int i;
02. for (i=0; i<4; i++)
03.       printf("%d ", str[i]); // the ASCII value of the constants 'j', 'o', 'e' are 106 111 101
04. printf("%s", str);
```

5. Consider the sample input on the right: each line consists of a test case. There are two formats for each line: the first is simply an integer x, the second is a character c followed by an integer x. No matter which format the input line contains, the program is required to process the value of the integer x, like printing in the third line below. Please answer the following questions:

Sample input:
n12
3456
7
p89
10

```
01  int x; char c;
02  while (c='␣', 1==scanf("%d", &x) || 2==scanf("␣%c%d", &c, &x)) {
03        printf("Type %d: data is %d\n", 1+(c!='␣'), x);
04  }
```

the symbol ␣ represents a space character in the above

(a) [5] Please explain the mechanism of input and testing of the condition specified in the while loop at line 2 of the above program? (The operator precedence of C operators are given in the figure at the right hand side.)

(b) [5] What is the output of the above program if it is compiled and executed?

Precedence	Operator	Associativity
1	++ -- () [] . ->(type){list	Left-to-right
2	++ -- + - ! ~ (type) * & sizeof Alignof	Right-to-left
3	* / %	Left-to-right
4	+ -	
5	<< >>	
6	< <= > >=	
7	== !=	
8	&	
9	^	
10	|	
11	&&	
12	||	
13[1]	?:	Right-to-Left
14	= += -= *= /= %= <<= >>= &= ^= |=	
15	,	Left-to-right

6. The following is a recursive function calculating x to its n-th power x^n

```
01 double power(double x, int n) {
02       if (n==0) return 1.;
03       return x * power(x, n-1);
04  }
```

(a) [4] What is a "recursive function"?

(b) [4] How many function calls of power(double, int) occur if a program invokes power() with "double y = power(2, 14)"?

(c) [4] Please compete the following power2() function such that it is doing equivalent things as power() but having less number of recursive calls. How many function calls of power2() occur if a program invokes power2() with "double y = power2(2, 14)"?

```
01 double power2(double x, int n) {
02       if (n==0) return 1.;
03       if (n%2==1)
```

```
04              return x * power2(x, _____);
05          else
06              return power2(x*x, _______);
07 }
```

(d) [4] Please compete the following power3() function such that it is doing equivalent things as power() or power2() but having less number of recursive calls. How many function calls of power3() occur if a program invokes power3() with “double y = power3(2, 14)”?

```
01 double power3(double x, int n) {
02          if (n==0) return 1.;
03          double x2 = power3(____, ____);
04          x2 *= x2;
05          if (n%2==1)
06              return _______;
07          else
08              return x2;
09 }
```

(e) [4] Please complete the following power4() function using the conditional operator "? :" to make the recursive function neater.

```
01 double power4(double x, int n) {
02          if (n==0) return 1.;
03          return (_____?_____:_____) * power4(_______, _______);
04 }
```

7. [10] Please write a program to read the test data as specified in the sample input. Each line is a test case containing three data x n_1 n_2, e.g. 147 10 2, $2 \le n_1, n_2 \le 16$. The first string x specifies a positive integer less than 10^{18} in the base n_1 encoding format. Please output this number in base n_2 encoding format.

Sample input:	Sample output:
147 10 2 11011 2 10 12345 6 15 AA5 13 8	10010011 27 845 3441

8. [10] Please design a program, read the two lower case character strings s and t, where s is specified in the first line and t in the second line as the following sample input shows. String t is obtained by randomly shuffling the characters in string s, picking a random place, and then adding an arbitrary character. The length of string s can be an integer from 0 to 100000000. Please find out and output the added character in string t.

Sample input:	Sample output:
ajlkhkfmaxnmvdfhauierhqwrew khearhjuiwmearwkxdfhlfmvanqa	a