CITY UNIVERSITY OF HONG KONG

Course code & title : CS2311 Computer Programming

Session : Semester B 2021/22

Time allowed : Two hours

This paper has 15 pages (including this cover page).

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1. This paper consists of four questions.
2. Answer **ALL** questions.
3. The whole solution should be submitted via Canvas.

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*This is **an open-book** examination.*

*Students **are allowed to use** the following materials/aids:* • Lecture notes and tutorial notes • Lecture video and tutorial video • All contents in the CS2311 2021/22 Sem B's course website in Canvas • Visual Studio 2019, VPN, Code Server provided by CityU CS Department
*Students **are not allowed to use** the following materials/aids:* • Anything not specified above, such as web search, WeChat, Whatspp, Facebook, Instagram, Email

Q1 (30%)	Q2 (10%)	Q3 (20%)	Q4 (20%)	Q5 (20%)	Total (100%)

Academic Honesty

I pledge that the answers in this examination are my own and that I will not seek or obtain an unfair advantage in producing these answers. Specifically,

- ❖ *I will not plagiarize (copy without citation) from any source;*
- ❖ *I will not communicate or attempt to communicate with any other person during the examination; neither will I give or attempt to give assistance to another student taking the examination; and*
- ❖ *I will use only approved devices (e.g., calculators) and/or approved device models.*
- ❖ *I understand that any act of academic dishonesty can lead to disciplinary action.*

I pledge to follow the Rules on Academic Honesty and understand that violations may lead to severe penalties.

Student ID:

Name:

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ASCII TABLE

Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char	Decimal	Hex	Char
0	0	[NULL]	32	20	[SPACE]	64	40	@	96	60	`
1	1	[START OF HEADING]	33	21	!	65	41	A	97	61	a
2	2	[START OF TEXT]	34	22	"	66	42	B	98	62	b
3	3	[END OF TEXT]	35	23	#	67	43	C	99	63	c
4	4	[END OF TRANSMISSION]	36	24	$	68	44	D	100	64	d
5	5	[ENQUIRY]	37	25	%	69	45	E	101	65	e
6	6	[ACKNOWLEDGE]	38	26	&	70	46	F	102	66	f
7	7	[BELL]	39	27	'	71	47	G	103	67	g
8	8	[BACKSPACE]	40	28	(	72	48	H	104	68	h
9	9	[HORIZONTAL TAB]	41	29	)	73	49	I	105	69	i
10	A	[LINE FEED]	42	2A	*	74	4A	J	106	6A	j
11	B	[VERTICAL TAB]	43	2B	+	75	4B	K	107	6B	k
12	C	[FORM FEED]	44	2C	,	76	4C	L	108	6C	l
13	D	[CARRIAGE RETURN]	45	2D	-	77	4D	M	109	6D	m
14	E	[SHIFT OUT]	46	2E	.	78	4E	N	110	6E	n
15	F	[SHIFT IN]	47	2F	/	79	4F	O	111	6F	o
16	10	[DATA LINK ESCAPE]	48	30	0	80	50	P	112	70	p
17	11	[DEVICE CONTROL 1]	49	31	1	81	51	Q	113	71	q
18	12	[DEVICE CONTROL 2]	50	32	2	82	52	R	114	72	r
19	13	[DEVICE CONTROL 3]	51	33	3	83	53	S	115	73	s
20	14	[DEVICE CONTROL 4]	52	34	4	84	54	T	116	74	t
21	15	[NEGATIVE ACKNOWLEDGE]	53	35	5	85	55	U	117	75	u
22	16	[SYNCHRONOUS IDLE]	54	36	6	86	56	V	118	76	v
23	17	[ENG OF TRANS. BLOCK]	55	37	7	87	57	W	119	77	w
24	18	[CANCEL]	56	38	8	88	58	X	120	78	x
25	19	[END OF MEDIUM]	57	39	9	89	59	Y	121	79	y
26	1A	[SUBSTITUTE]	58	3A	:	90	5A	Z	122	7A	z
27	1B	[ESCAPE]	59	3B	;	91	5B	[	123	7B	{
28	1C	[FILE SEPARATOR]	60	3C	<	92	5C	\	124	7C	|
29	1D	[GROUP SEPARATOR]	61	3D	=	93	5D	]	125	7D	}
30	1E	[RECORD SEPARATOR]	62	3E	>	94	5E	^	126	7E	~
31	1F	[UNIT SEPARATOR]	63	3F	?	95	5F	_	127	7F	[DEL]

Source: https://simple.wikipedia.org/wiki/ASCII

Question 1 (30%) Program Structure and Debugging

The code listing in each sub-question contains bugs and it may not be successfully compiled. For each sub-question indicated in the following table, **correct exactly one statement except the cout statement** in the code listing so that it can produce the result shown on the right.

Last Digit of Your Student Number	Answer the 5 sub-questions with a tick symbol ✓ according to your student number									
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**
0			✓	✓	✓		✓	✓		
1			✓			✓		✓		✓
2	✓	✓			✓				✓	✓
3		✓		✓		✓	✓		✓	
4			✓	✓	✓		✓			✓
5	✓		✓			✓		✓	✓	
6	✓	✓			✓		✓	✓		
7		✓		✓		✓		✓		✓
8			✓	✓	✓				✓	✓
9	✓		✓			✓	✓		✓	

		Input	**Output**	**My Answer** [Insert the **complete code listing** in the box provided]

a.	`#include<iostream>`
	`using namespace std;`
	`int main() {`
	`  int r, x(2);`
	`  char y = 5;`
	`  char c = 'A' - 'Z' + 'A';`
	`  r = y % x;`
	`  c += r;`
	`  cout << c;`
	`  return 0;`
	`}`
			J	

b.	`#include<iostream>`
	`using namespace std;`
	`void main() {`
	`  char s[] = "C"; cin >> s;`
	`  int i; cin >> i;`
	`  cout << s[i];`
	`  i++;`
	`  cout << s << ".";`
	`}`
		C++
		
		3
			C++.	

c.	`#include<iostream>`
	`using namespace std;`
	`void main() {`
	`  int a[] = { 1, 2 }, * p = a;`
	`  int b = *(p + 1);`
	`  int c = a[*(++p) - a[0]];`
	`  int d = b + c;`
	`  cout << d << b;`
	`}`
			32	

d.	`#include<iostream>`
	`using namespace std;`
	`int main() {`
	`  int x = 3;`
	`  while (x < 10) {`
	`  if (x == 4)`
	`  cout << x << " x Hello" << endl;`
	`  x++;`
	`  }`
	`  return 0;`
	`}`
			4 x Hello
			6 x Hello
			8 x Hello	

e.	`#include <iostream>`
	`using namespace std;`
	`void SwapandAdd(int m, int n) {`
	`  int x = m + 1;`
	`  m = n + 1;`
	`  n = x + 1;`
	`}`
	`int main() {`
	`  int x = 5; int y = x - 2;`
	`  SwapandAdd(x, y);`
	`  cout << x << " " << y;`
	`  return 4;`
	`}`
			4 7	

f.	`#include <iostream>`
	`using namespace std;`
	`char maze[] = "CS2311IsComputerProgramming";`
	`int k = 0;`
	`void search(int i, char c) {`
	`  if (maze[i] > c && k <= 4) {`
	`  cout << maze[i]; k++;`
	`  search(i--, c);`
	`  search(i + 1, c);`
	`  }`
	`}`
	`int main() { search(9, 'Z'); return 0; }`
			omom	

g.	`#include<iostream>`
	`using namespace std;`
	`class dummy {`
	`public:`
	`  int x;`
	`  dummy(int i) { x = i * i; }`
	`  void add(int i) { x = x + i; }`
	`  int isLarger(dummy o, int c) {`
	`  if (x >= x + c)`
	`  {  add(c);`
	`  return x;`
	`  }`
	`  else return x;`
	`  }`
	`};`
	`int main() {`
	`  dummy a(5), b(-5); int c = 2;`
	`  a.add(c);`
	`  cout << a.isLarger(b, c);`
	`  return 0;`
	`}`
			29	

h.	`#include<iostream>`
	`#include <fstream>`
	`using namespace std;`
	`int main() {`
	`  ofstream o;`
	`  ifstream i;`
	`  char s[60];`
	`  o.open("hello.txt");`
	`  o << "hello";`
	`  o.is_open();`
	`  i.open("hello.txt");`
	`  i >> s;`
	`  cout << s;`
	`  i.close();`
	`}`
		3	44	

i.	`#include<iostream>`
	`using namespace std;`
	`int main() {`
	`  char c = 'S';`
	`  int i = 0;`
	`  char exam[] = { "CS2311 2021/2022 Exam" };`
	`  char* a = exam;`
	`  while (i >= 0)`
	`  if (a[i - 1] == c)`
	`  break;`
	`  cout << i;`
	`  return 0;`
	`}`
			3	

j.	`#include<iostream>`
	`using namespace std;`
	`int main() {`
	`  int k = 0, i = 0;`
	`  cin >> k;`
	`  int r = k;`
	`  char* p = new char[k];`
	`  char q[50];`
	`  cin >> q;`
	`  while (k > 1 && q[i] != 0) {`
	`  p[i] = q[i];`
	`  i++; k--;`
	`  }`
	`  if (i < k) p[i] = 0;`
	`  cout << p;`
	`}`
		3
		NoYes
			No	

Question 2. (10%) Explain **your answer** in **either** Question 1(i) **or** Question 1(j). Your answer should explain the mistakes in the original code, your idea of correction, and how you implement your idea to correct the mistakes while prevent introducing other mistakes.

Question 3. (20%) Write a program to accept a positive single-digit odd integer `N` (e.g., 3, 5, 7, 8, 9) and print a pyramid using numbers with height N.

Write your code in good programming style.

```
Enter number of rows: 3
          1
      2   3   2
  3   4   5   4   3
```

```
Enter number of rows: 5
                  1
              2   3   2
          3   4   5   4   3
      4   5   6   7   6   5   4
  5   6   7   8   9   8   7   6   5
```

```
Enter number of rows: 7
                          1
                      2   3   2
                  3   4   5   4   3
              4   5   6   7   6   5   4
          5   6   7   8   9   8   7   6   5
      6   7   8   9  10  11  10   9   8   7   6
  7   8   9  10  11  12  13  12  11  10   9   8   7
```

```
Enter number of rows: 8
                              1
                          2   3   2
                      3   4   5   4   3
                  4   5   6   7   6   5   4
              5   6   7   8   9   8   7   6   5
          6   7   8   9  10  11  10   9   8   7   6
      7   8   9  10  11  12  13  12  11  10   9   8   7
  8   9  10  11  12  13  14  15  14  13  12  11  10   9   8
```

```
Enter number of rows: 9
                                  1
                              2   3   2
                          3   4   5   4   3
                      4   5   6   7   6   5   4
                  5   6   7   8   9   8   7   6   5
              6   7   8   9  10  11  10   9   8   7   6
          7   8   9  10  11  12  13  12  11  10   9   8   7
      8   9  10  11  12  13  14  15  14  13  12  11  10   9   8
  9  10  11  12  13  14  15  16  17  16  15  14  13  12  11  10   9
```

My answer is as follows:

Question 4 (20%)

Harmonic Mean. Write a program that meets all the following requirements.

a. Display the following input message and accept one integer `N` as its input.

```
Input a positive odd number (0 to end):
```

b. When `N` is positive, the program should output the harmonic mean H_N using the following formula.

$$H_N = N / (1/1 + 1/2 + 1/3 + 1/4 + ... + 1/N)$$

c. When `N` is negative, the program should ask the user to input a number again.

d. When `N` is zero (`0`), the program should end its execution without computing H_N and display the total number of times that the input message (see task (a)) has been displayed in the console window.

e. Format the output for H_N to 4 decimal places followed by a line break.

Example 1

```
Input a positive odd number (0 to end): -3
Input a positive odd number (0 to end): -2
Input a positive odd number (0 to end): -4
Input a positive odd number (0 to end): 3
The Harmonic mean is: 1.6364
Users have inputted for 4 time(s).
```

Example 2

```
Input a positive odd number (0 to end): -2
Input a positive odd number (0 to end): 0
Users have inputted for 2 time(s).
```

My answer is as follows:

Question 5 (20%)

The file **luck.txt** is a word dictionary, which contains 10,000 lines. Each line contains exactly an English Word. Write a program to meet the following requirements:

- The program accepts one word from Console.
- It determines whether there is any word in the file starting with the inputted word and output all of them to Console.
- It handles file management properly.
- It keeps all the words in the file in an array named `source[]`.
- You are allowed to use <iostream> and <fstream>. **All other libraries are not allowed to use.**
- It **only uses pointers** to update the array `source` or read from `source`. (i.e., do not use syntax like `source[i]` to refer to the element kept in `source[i]`.)
    - Note: If your program uses such array syntaxes, marks will be deducted.
- You may assume that each word contains no more than 20 characters.

Sample contents in luck.txt.

- **Note that the exact file is NOT provided. You need to construct it yourself.**

```
cs2310
cs2311
cs2350
computer
programming
is
fun
```

Example 1

```
cs
cs is a prefix of cs2310
cs is a prefix of cs2311
cs is a prefix of cs2350
```

Example 2

```
compute
compute is a prefix of computer
```

Example 3

```
fun
fun is a prefix of fun
```

Example 4

```
Exam
Exam is not defined in the source file
```

My answer is as follows:

Explain your code in terms of file management and how you compare the values kept in different pointer variables.

*** END ***