
UNIVERSITI SAINS MALAYSIA

Second Semester Examination
2014/2015 Academic Session

June 2015

CPT111/CPM111 – Principles of Programming
[Prinsip Pengaturcaraan]

Duration : 2 hours
[Masa : 2 jam]

INSTRUCTIONS TO CANDIDATE:

[ARAHAN KEPADA CALON:]

- Please ensure that this examination paper contains **THREE** questions in **FOURTEEN** printed pages before you begin the examination.

*[Sila pastikan bahawa kertas peperiksaan ini mengandungi **TIGA** soalan di dalam **EMPAT BELAS** muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]*

- Answer **ALL** questions.

*[Jawab **SEMUA** soalan.]*

- You may answer the questions either in English or in Bahasa Malaysia.

[Anda dibenarkan menjawab soalan sama ada dalam bahasa Inggeris atau bahasa Malaysia.]

- In the event of any discrepancies, the English version shall be used.

[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi bahasa Inggeris hendaklah diguna pakai.]

1. (a) (i) What is a logical error?
- (ii) Why is `main` function special in C++?
- (iii) What is the role of `#include` directive in C++?
- (iv) What is the difference between `while` and `do-while` loop?
- (v) What is the difference between `get()` and `getline()`?

(30/100)

- (b) Indicate whether the following statement is **TRUE** or **FALSE**.

- (i) `Hello!` is a legal C++ identifier.
- (ii) The statement `num = num + 3` is equivalent to `num += 3 + num`.
- (iii) The expression `!(x>10)` is equivalent to the expression `x<10`.
- (iv) The output of the following C++ code is 150. (Assume all variables are properly declared.)

```
num = 100;
while (num <=148)
    num = num + 5;
cout << num << endl;
```

- (v) If the `while` expression becomes false in the middle of the `while` loop, the loop terminates immediately.

(20/100)

- (c) What is the output of the following C++ code? Show the trace.

```
count = 1;
num = 15;
while (count < 15)
{
    num = num - 1;
    count++;
}
cout << count << " " << num << endl;
```

(10/100)

- (d) (i) Rewrite the following C++ code using `switch/case`.

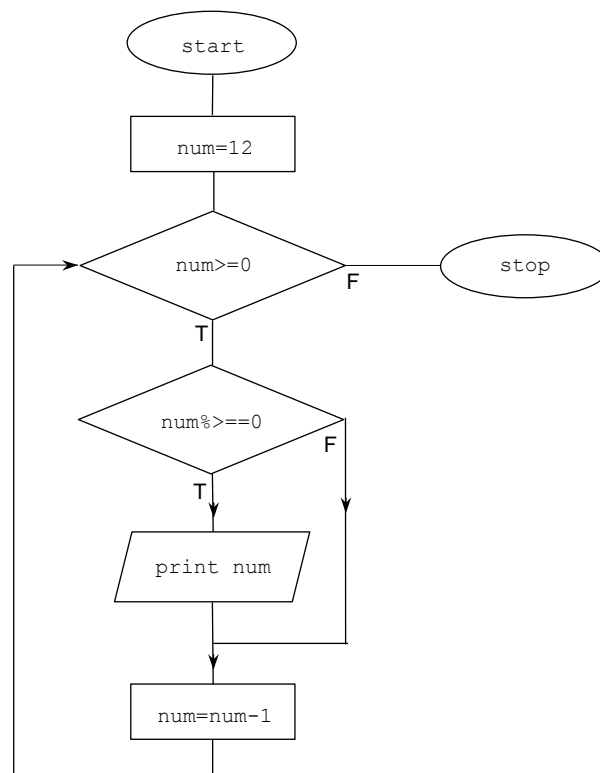
```
int selection;
cin >> selection;
if (selection == 1)
    cout << "Your selection is Option 1";
else if (selection == 2)
    cout << "Your selection is Option 2";
else if (selection == 3)
    cout << "Your selection is Option 3";
else
    cout << "Invalid selection";
```

- (ii) Rewrite the following C++ code using `for` loop.

```
int number = 2;
bool done = false;
while (!done)
{
    cout << number << endl;
    number = number * 2;
    if (number >= 64)
        done = true;
}
```

(30/100)

- (e) Write a C++ program for the following flowchart.



(10/100)

2. (a) The following C++ code uses `while` loops.

```

#include <iostream>
#include <iomanip>

using namespace std;

int main()
{
    int i, j;

    for (i = 1; i <= 9; i++)
    {
        for (j = 1; j <= (9 - i); j++)
            cout << " ";
        for (j = 1; j <= i; j++)
            cout << setw(1) << j;
        for (j = (i - 1); j >= 1; j--)
            cout << setw(1) << j;
        cout << endl;
    }
}

```

- (i) What is the output of this program?
- (ii) What does `iostream` and `iomanip` mean? Why we need to use these two header types in this program?

(20/100)

- (b) The following code uses `while` loops.

```

cout << "Number    Square of Number" << endl;
counter = 1;
while (counter <= 10)
{
    cout << setw(4) << counter << setw(18)
        << counter * counter << endl;
    counter++;
}

cout << "Upper case letters are: ";

chCounter = 'A';
while (chCounter <= 'Z')
{
    cout << chCounter << " ";
    chCounter++;
}
cout << endl;

```

- (i) Rewrite the C++ code using `for` loops.
- (ii) Rewrite the C++ code using `do-while` loops. (30/100)
- (c) When you are using a function in a C++ program, what are the **three (3)** components which must be present in the program? (10/100)
- (d) C++ supports three types of function parameter passing, i.e pass by value, by reference and by pointer. The program below shows an example of a function call using passing by value parameter.

```
#include <iostream>
using namespace std;
int calculate (int);

int main()
{
    int xy;
    xy = 12;
    cout << "original value : " << xy << endl;
    xy = calculate (xy);
    cout << "new value : " << xy << endl;
}

int calculate (int data)
{
    for (int i = 1; i <= 5; i++)
        data += i;
    return data;
}
```

- (i) Modify the program so that the function uses call by reference.
- (ii) Modify the program so that the function uses pointer.
- (iii) What is the output of the above program?

(40/100)

3. (a) Consider the outline of the C++ program below:

```

#include <fstream>
using namespace std;

int main()
{
    const int year = 20, month = 12;
    int rainfall[year][month];
    int m, y, max, maxY;
    ifstream infile;
    ofstream outfile;

    infile.open ("Rain.dat");
    outfile.open ("MaxRain.dat");

    infile.close();
    outfile.close();
    return 0;
}

```

Note: For question 3(a)(i), 3(a)(ii) and 3(a)(iii), you are required to write a suitable C++ code segments and not to re-write the whole program.

- (i) Add or modify the appropriate lines so that the program test whether the files are successfully opened, and if not print error message, and exit from the program.
- (ii) Write C++ code that reads in data from the formatted file "Rain.dat", store in the array variable `rainfall`. The fail "Rain.dat" holds up to twenty years of monthly rainfall figures of Peninsular Malaysia as follow:

```

12  8   14  28  43  ...  23  10  {data from month
                                Jan - Dec for year 1}
6   10  0   12  67  ...  6   2   {data for year 2}
..  ..  ..  ..  ..  ...  ..  ..
8   7   12  7   23  ...  9   11  {data for year 20}

```

- (iii) Write C++ code that can determine the year that recorded the maximum rainfall for each month from Jan – Dec, and save the result in the format below to a file designated by variable `outfile`:

Month	Year
1	3
2	7
3	10
.	.
12	15

The output above implies that the highest January rainfall was in year 3, the highest February rainfall was in year 7, etc.

(50/100)

(b) What is the output of each of the following programs?

(i)

```
#include <iostream>
using namespace std;

int main()
{
    char string1[] = " How are you?";

    cout << "string is : " << string1 << endl;
    for (int i = 0; string1[i] != '\0'; i++)
        cout << string1[i] << "_";
    return 0;
}
```

(ii)

```
#include <iostream>
using namespace std;

int main()
{
    int ch = 100;
    int *ptr = &ch;

    cout << "Value stored at pointer ptr is : ";
    cout << *ptr << endl;
    return 0;
}
```

(iii)

```
#include <iostream>
using namespace std;

int main()
{
    int array [3][4] = {{1,2,3,4},{2,3,4,5},{3,4,5,6}};

    cout << "Array contains:" << endl;

    for (int i = 0; i < 3; i++)
    {
        for (int j = 0; j < 4; j++)
            cout << array[i][j] + i + j << " ";
        cout << endl;
    }
    return 0;
}
```

(50/100)

1. (a) (i) Apakah maksud kesalahan logik?
(ii) Kenapa fungsi `main` adalah istimewa dalam C++?
(iii) Apakah tugas arahan `#include` dalam C++?
(iv) Apakah perbezaan di antara gegelung `while` dan `do-while`?
(v) Apakah perbezaan antara `get()` and `getline()`?

(30/100)

- (b) Nyatakan sama ada kenyataan berikut **BETUL** atau **SALAH**.

- (i) `Hello!` ialah pengecam C++ yang sah.
(ii) Kenyataan `num = num + 3` adalah bersamaan dengan kenyataan `num += 3 + num`.
(iii) Ungkapan `!(x>10)` adalah bersamaan dengan ungkapan `x<10`.
(iv) Output bagi kod C++ berikut ialah 150. (Andaikan semua pemboleh ubah sudah diisytiharkan.)

```
num = 100;
while (num <=148)
    num = num + 5;
cout << num << endl;
```

- (v) Jika ungkapan `while` menjadi palsu di pertengahan gegelung `while`, gegelung itu akan tamat dengan serta merta.

(20/100)

- (c) Apakah output bagi kod C++ berikut? Tunjukkan surihan.

```
count = 1;
num = 15;
while (count < 15)
{
    num = num - 1;
    count++;
}
cout << count << " " << num << endl;
```

(10/100)

- (d) (i) Tulis kembali kod C++ berikut dengan menggunakan `switch/case`.

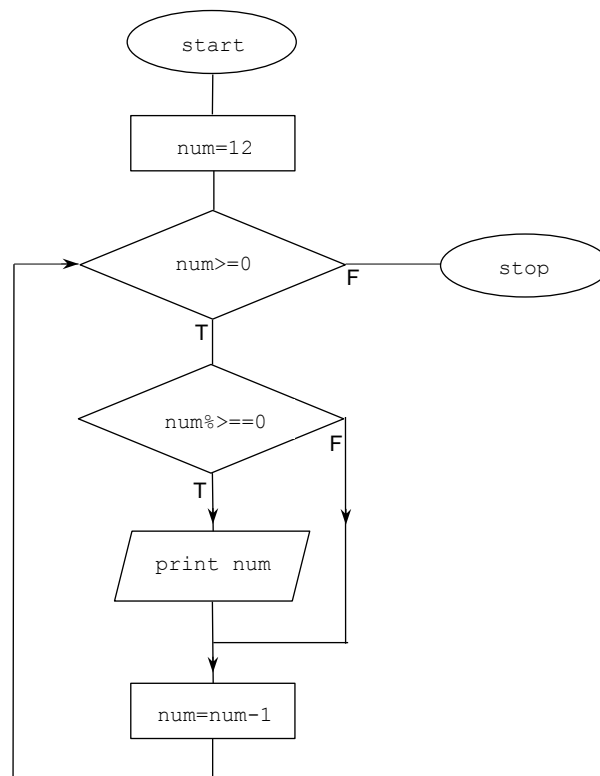
```
int selection;
cin >> selection;
if (selection == 1)
    cout << "Your selection is Option 1";
else if (selection == 2)
    cout << "Your selection is Option 2";
else if (selection == 3)
    cout << "Your selection is Option 3";
else
    cout << "Invalid selection";
```

- (ii) Tulis kembali kod C++ di bawah dengan menggunakan `gegelung for`.

```
int number = 2;
bool done = false;
while (!done)
{
    cout << number << endl;
    number = number * 2;
    if (number >= 64)
        done = true;
}
```

(30/100)

(e) Tuliskan satu atur cara C++ untuk carta alir berikut.



(10/100)

2. (a) Kod C++ berikut mengguna gegelung while.

```

#include <iostream>
#include <iomanip>

using namespace std;

int main()
{
    int i, j;

    for (i = 1; i <= 9; i++)
    {
        for (j = 1; j <= (9 - i); j++)
            cout << " ";
        for (j = 1; j <= i; j++)
            cout << setw(1) << j;
        for (j = (i - 1); j >= 1; j--)
            cout << setw(1) << j;
        cout << endl;
    }
}

```

- (i) Apakah output program C++ ini?
- (ii) Apakah maksud `iostream` dan `iomanip`? Mengapa kita perlu menggunakan kedua-dua jenis pengepala/pengatas ini dalam program ini?

(20/100)

- (b) Kod berikut menggunakan gegelung `while`.

```

cout << "Number    Square of Number" << endl;
counter = 1;
while (counter <= 10)
{
    cout << setw(4) << counter << setw(18)
        << counter * counter << endl;
    counter++;
}

cout << "Upper case letters are: ";

chCounter = 'A';
while (chCounter <= 'Z')
{
    cout << chCounter << " ";
    chCounter++;
}
cout << endl;

```

- (i) Tulis kembali kod C++ ini menggunakan gegelung `for`.
- (ii) Tulis kembali kod C++ ini menggunakan gegelung `do-while`.

(30/100)

- (c) Apabila anda mengguna fungsi di dalam sesuatu atur cara C++, apakah **tiga (3)** komponen yang perlu wujud di dalam atur cara tersebut?

(10/100)

- (d) C++ mendukung tiga jenis penghantaran parameter, yaitu penghantaran melalui nilai, rujukan dan penunjuk. Atur cara berikut menunjukkan satu contoh panggilan fungsi yang menggunakan penghantaran parameter melalui nilai.

```
#include <iostream>
using namespace std;
int calculate (int);

int main()
{
    int xy;
    xy = 12;
    cout << "original value : " << xy << endl;
    xy = calculate (xy);
    cout << "new value : " << xy << endl;
}

int calculate (int data)
{
    for (int i = 1; i <= 5; i++)
        data += i;
    return data;
}
```

- (i) Ubahsuai atur cara tersebut supaya fungsi menggunakan panggilan melalui rujukan.
- (ii) Ubahsuai atur cara tersebut supaya fungsi menggunakan penunjuk.
- (iii) Apakah output program tersebut?

(40/100)

3. (a) Pertimbangkan garis kasar atur cara C++ di bawah:

```
#include <fstream>
using namespace std;

int main()
{
    const int year = 20, month = 12;
    int rainfall[year][month];
    int m, y, max, maxY;
    ifstream infile;
    ofstream outfile;

    infile.open ("Rain.dat");
    outfile.open ("MaxRain.dat");

    infile.close();
    outfile.close();
    return 0;
}
```

Nota: Untuk soalan 3(a)(i), 3(a)(ii) and 3(a)(iii), anda dikehendaki menulis cebisan kod C++ yang bersesuaian dan tidak menulis keseluruhan atur cara.

- (i) Tambah atau ubah suai baris-baris berkenaan supaya atur cara berkenaan menyemak sama ada fail-fail dibuka dengan jayanya, dan jika tidak cetak mesej ralat, dan keluar dari atur cara.
- (ii) Tulis kod C++ untuk baca data dari fail "Rain.dat" yang berformat, dan simpan di dalam pemboleh ubah tatasusunan bernama `rainfall`. Fail "Rain.dat" menyimpan nilai-nilai hujan bulanan selama dua puluh tahun untuk Semenanjung Malaysia seperti berikut:

```
12  8   14  28  43  ...  23  10  {data from month
                                Jan - Dec for year 1}
6   10  0   12  67  ...  6   2   {data for year 2}
..  ..  ..  ..  ..  ...  ..  ..
8   7   12  7   23  ...  9   11  {data for year 20}
```

- (iii) Tulis kod C++ yang boleh menentukan tahun yang mencatat hujan maksimum untuk setiap bulan dari Jan – Dec, dan simpan keputusan tersebut menggunakan format di bawah ke suatu fail yang dirujuk oleh pemboleh ubah `outfile`.

Month	Year
1	3
2	7
3	10
.	.
12	15

Output di atas menunjukkan hujan maksimum untuk bulan Januari ialah pada tahun 3, hujan maksimum untuk bulan Februari ialah pada tahun 7, dan seterusnya.

(50/100)

(b) Apakah output untuk setiap atur cara berikut?

(i)

```
#include <iostream>
using namespace std;

int main()
{
    char string1[] = " How are you?";

    cout << "string is : " << string1 << endl;
    for (int i = 0; string1[i] != '\0'; i++)
        cout << string1[i] << "_";
    return 0;
}
```

(ii)

```
#include <iostream>
using namespace std;

int main()
{
    int ch = 100;
    int * ptr = &ch;

    cout << "Value stored at pointer ptr is : ";
    cout << *ptr << endl;
    return 0;
}
```

(iii)

```
#include <iostream>
using namespace std;

int main()
{
    int array [3][4] = {{1,2,3,4},{2,3,4,5},{3,4,5,6}};

    cout << "Array contains:" << endl;

    for (int i = 0; i < 3; i++)
    {
        for (int j = 0; j < 4; j++)
            cout << array[i][j] + i + j << " ";
        cout << endl;
    }
    return 0;
}
```

(50/100)