UNIVERSITI SAINS MALAYSIA

First Semester Examination
2014/2015 Academic Session

December 2014/January 2015

CPT111 – 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 **FIFTEEN** printed pages before you begin the examination.

  *[Sila pastikan bahawa kertas peperiksaan ini mengandungi **TIGA** soalan di dalam **LIMA 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) Suppose a, b, and sum are **int** variables and c is a **double** variable. What value is assigned to each variable after each statement executes? The statement is executed one after another. Suppose a = 3, b = 5, and c = 14.1.

(i) sum = a + b + c;

(ii) c /= a;

(iii) b += c - a;

(iv) a *= 2 * b + c;

(6/100)

(b) Suppose the input is 5. What is the value of alpha after the following C++ code executes?

```
cin >> alpha;
switch (alpha)
{
   case 1:
   case 2:
      alpha = alpha + 2;
      break;
   case 4:
      alpha++;
   case 5:
      alpha = 2 * alpha;
   case 6:
      alpha = alpha + 5;
      break;
   default:
      alpha--;
}
```

(2/100)

(c) What is the output of the following program segments?

(i)
```
int count = 5;
while (count-- > 0)
cout << count << " ";
cout << endl;
```

(ii)
```
int x = 19683;
int i;
int y = 0;
for (i = x; i >= 1; i = i / 3)
y++;
cout << "x = " << x << ", y = " << y << endl;
```

Is there a relationship between the variables x and y? If yes, state the relationship?

(7/100)

(d) Write a C++ program that will prompts the user to input two numbers. If one of the numbers is 0 or less than 0, the program should output a message indicating that both numbers must be nonzero and ask the user to continue input both numbers until both numbers are nonzero. If the first number is greater than the second number, swap the number. The program then will display the sum of the even integers between and including two numbers entered by the user. In other words, if the user enters an even number, that number should be included in the sum. For example if the user enters the integer 2 and 7, the sum is 12 (2+4+6). If the user enters the integers 2 and 8, the sum is 20 (2+4+6+8).

(15/100)

2. (a) Identify whether the following function calls are **TRUE** or **FALSE** for the following function prototypes:

	Function Prototype	Function Call	TRUE/FALSE
i	`int funct1 (int,int,string);`	`int val; val=funct1();`	
ii	`void funct2 (void);`	`string val; val=funct2(int);`	
iii	`double funct3 (void);`	`cout << funct3();`	
iv	`int funct4(int,double,char);`	`int val; val=funct4(4,2.5,'y');`	
v	`void funct5(char,char);`	`cout <<funct('a','b','c');`	
vi	`float funct6(float,int);`	`cout << funct6(2.5, 3);`	

(6/100)

(b) Given the following functions

```
int myFunction (int a, int b)
  {
    for (int i=a;i<=b;i++)
      a=i+a;
    return a;
  }
```

```
void myFunction2(int ary[], int s)
{
   int i=0;
   while (i<s-1) {
     ary[i]=ary[i] * 2;
     i++;
     }
 }
```

What is the output for each of the following function calls:

(i)
```
cout << myFunction (2,2);
```

(ii)
```
cout << myFunction (4,6);
```

(iii)
```
int mydata[4]={1,2,3,4};
myFunction2 (mydata,4);
for (int i = 0; i<4;i++)
  cout << mydata[i] << " ";
```

(6/100)

(c) Program is written to estimate the electrical power consumed by each electrical appliance in the month. Examples of electric appliances are:

- Lights (16 watts)
- Refrigerator (550 watts)
- TV (150 watts)
- Ceiling Fan (50 watts)

Note: 1000 watts = 1 kWh = 1unit

Your program should be able to compute the electrical power consumption charge based on the average hours consumed by each of electrical appliance every day. Finally, the program should display the electric power consumption charge for a month (Assume 1 month is 30 days). The following information is the electric tariff:

1 units = 0.21 cents/kWh

For example, if there are 4 lights with 16 watts each and 8 hours usage every day. Thus, total units = (4 unit x 16 watts x 8 hours x 30 days)/1000 = 15.36
Electric charge = 15.36 x 0.21 cents/kWh = RM 3.22

Your program should accept input such as number of electrical items, watts, total hours used per day. The program should have the following functions:

- **`Accept_input`** function. This function does not receive any parameters. This function will accept input from a user and compute total units consumed by electric item. Finally, it returns a value of the total units consumed by electric appliance.

- **`Calculate_bill`** function. This function will calculate the electric charge based on the electric tariff given above. This function will receive a parameter of total units consumed by electric appliance and finally it returns a value of the electric power consumption charge.

- **`Display_info`** function. This function will display the electric charge which is returned by **`Calculate_bill`** function.

Based on the above description, answer the following:

(i) Write correct C++ statements for the following function prototypes:

- `Accept_input`
- `Calculate_bill`
- `Display_info`

(3/100)

(ii) Write a complete C++ program for the following functions:

- `Accept_input`
- `Calculate_bill`
- `Display_info`

(15/100)

(iii) Given the following C++ `main()` program segment:

```
main()
  {
     float total_units, electric_charge;
     …..
     …..
     total_units= _________// function call for Accept_input function
     electric_charge= ___// function call for Calculate_bill function
     _____________// function call for Display_info function

        …..
        …..
} // end of main
```

Write the correct C++ statements for the above function calls.

(5/100)

3. (a) (i) Write a C++ statement to dynamically allocate memory for an array whose size is not known until runtime.

(ii) Write a statement to reclaim the memory allocated below:

```
int* num = new int;

*num = 10;
```

(4/100)

(b) What is the content of `myArray` after the execution of the following code.

```
int ctr = 0;
int myArray[3];

for ( int i = 0; i < 3; i++)
{
   myArray[i] = ctr;
   ctr = ctr + i;
}
```

(3/100)

(c) What is the output of each of the following program segments?

(i)
```
int num[3];

for ( int cnt = 1; cnt < 3; cnt++)
{
   num[cnt] = cnt + 1;
   cout << num[cnt];
}
```

(ii)
```
char string1[] = " How are you?";

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

(iii)
```
int ch = 100;
int * ptr = &ch;

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

(iv)
```
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] << " ";
   cout << endl;
}
```

(8/100)

(d) State and correct the error(s) for the following questions:

(i) The `for` loop should initialize all array values to -1:

```
int array [10];

for (int i  = 0; i < 9; i++)
   array[i] = -1;
```

(ii) The `for` loop should print all array values:

```
int array [10];

for (int i  = 0; i <= 10; i++)
   cout << array[i];
```

(iii) The following program displays the reverse of row and column of a 3 x 3 array:

```
int array[3][3] = {{1,2,3},{4,5,6},{7,8,9}};

for ( int I = 0; I < 3; I ++)
{
   for ( int j = 0; j < 3; j++)
      cout << array [i][j];
   cout << endl
}


example output :
       1 4 7
       2 5 8
       3 6 9
```

(5/100)

(e) (i) Write a function named `Reverse` that takes as its argument an array of floating values and the size of the array. The function must reverse the values in the array.

```
example
input array : 5.8  2.3  4.5  7.8
output array : 7.8  4.5  2.3  5.8
```

(5/100)

(ii) Write a C++ segment code that will

(A) create a 3 by 3 array named `Array`.

(B) initialise the array declared in (A) with the value according to row index:

```
Array : 1 1 1
        2 2 2
        3 3 3
```

(C) Update the array in (B) by adding the row index to the original value.

```
Before :   1 1 1
           2 2 2
           3 3 3

After  :   2 2 2
           4 4 4
           6 6 6
```

(iii) Sum each column and save in one dimensional array called `Total_Col` and sum each row and save in a one dimensional array called `Total_Row`.

(10/100)

1. (a) Anggapkan a, b, dan sum adalah pemboleh ubah **int** dan c adalah pemboleh ubah **double.** Apakah nilai yang diumpukkan kepada setiap pemboleh ubah selepas setiap kenyataan berikut dilaksanakan. Setiap kenyataan ini dilaksanakan secara berturutan. Anggapkan a = 3, b = 5, dan c = 14.1.

(i) sum = a + b + c;

(ii) c /= a;

(iii) b += c - a;

(iv) a *= 2 * b + c;

(6/100)

(b) Anggapkan input adalah 5. Apakah nilai alpha selepas kod C++ berikut dilaksanakan?

```
cin >> alpha;
switch (alpha)
{
   case 1:
   case 2:
      alpha = alpha + 2;
      break;
   case 4:
      alpha++;
   case 5:
      alpha = 2 * alpha;
   case 6:
      alpha = alpha + 5;
      break;
   default:
      alpha--;
}
```

(2/100)

(c) Apakah output bagi segmen atur cara berikut?

(i)
```
int count = 5;
while (count-- > 0)
cout << count << " ";
cout << endl;
```

(ii)
```
int x = 19683;
int i;
int y = 0;
for (i = x; i >= 1; i = i / 3)
y++;
cout << "x = " << x << ", y = " << y << endl;
```

Adakah terdapat perhubungan di antara pemboleh ubah x dan y? Jika ya, nyatakan perhubungan tersebut.

(7/100)

(d) Tulis satu atur cara C++ yang akan meminta pengguna supaya memasukkan dua nombor. Jika salah satu dari nombor tersebut adalah 0 atau kurang dari 0, atur cara perlu keluarkan mesej memberitahu bahawa kedua-dua nombor mestilah lebih besar dari kosong, dan meminta pengguna memasukkan semula kedua-dua nombor, sehingga kedua-dua nombor adalah bukan sifar. Jika nombor pertama lebih besar daripada nombor kedua, tukar ganti dua nombor tersebut. Atur cara seterusnya akan memaparkan hasil tambah semua integer genap di antara dua nombor tersebut, termasuk kedua-dua nombor yang dimasukkan oleh pengguna. Dengan kata lain, jika pengguna memasukkan nombor genap, nombor tersebut mesti dimasukkan sekali dalam jumlah. Contohnya, jika pengguna memasukkan integer 2 dan 7, jumlah adalah 12 (2+4+6). Jika pengguna masukkan integer 2 dan 8, jumlah adalah 20 (2+4+6+8).

(15/100)

2. (a) Tentukan sama ada panggilan-panggilan fungsi berikut adalah **BETUL** atau **SALAH**

	Prototaip Fungsi	**Panggilan Fungsi**	**BENAR/SALAH**
i	`int funct1 (int,int,string);`	`int val; val=funct1();`	
ii	`void funct2 (void);`	`string val; val=funct2(int);`	
iii	`double funct3 (void);`	`cout << funct3();`	
iv	`int funct4(int,double,char);`	`int val; val=funct4(4,2.5,'y');`	
v	`void funct5(char,char);`	`cout <<funct('a','b','c');`	
vi	`float funct6(float,int);`	`cout << funct6(2.5, 3);`	

(6/100)

(b) Diberi fungsi-fungsi berikut:

```
int myFunction (int a, int b)
  {
    for (int i=a;i<=b;i++)
      a=i+a;
    return a;
   }
```

```
void myFunction2(int ary[], int s)
{
   int i=0;
   while (i<s-1) {
     ary[i]=ary[i] * 2;
     i++;
     }
 }
```

Apakah paparan untuk setiap panggilan fungsi berikut:

(i)
```
cout << myFunction (2,2);
```

(ii)
```
cout << myFunction (4,6);
```

(iii)
```
int mydata[4]={1,2,3,4};
myFunction2 (mydata, 4);
for (int i = 0; I<4;i++)
   cout << mydata[i] <<" ";
```

(6/100)

(c) Atur cara ditulis untuk menganggar caj elektrik yang diguna oleh setiap peralatan elektrik dalam sebulan. Contoh-contoh peralatan elektrik adalah:

- Lampu (16 watt)
- Peti sejuk (550 watt)
- TV (150 watts)
- Kipas siling (50 watt)

Nota: 1000 watt = 1 kWh = 1 unit

Atur cara anda perlu mengira caj penggunaan kuasa elektrik berdasarkan jam purata yang digunakan oleh setiap peralatan elektrik setiap hari. Akhirnya atur cara tersebut perlu memaparkan caj penggunaan kuasa elektrik pada bulan tersebut (Anggapkan 1 bulan adalah 30 hari). Maklumat berikut adalah tarif elektrik:

1 units = 0.21 sen/kWh

Contohnya, jika terdapat 4 lampu dengan 16 watt setiap satu dan 8 jam kegunaan setiap hari . Maka jumlah unit = (4 unit x 16 watt x 8 jam x 30 hari)/1000 = 15.36
Caj elektrik = 15.36 x 0.21 sen/kWh = RM 3.22

Atur cara anda perlu menerima input seperti bilangan peralatan elektrik, watt dan jumlah jam yang digunakan setiap hari. Atur cara tersebut perlu mempunyai fungsi-fungsi berikut:

- Fungsi **`Accept_input`**. Fungsi ini tidak menerima apa-apa parameter. Fungsi ini akan menerima input dari pengguna dan mengira jumlah unit yang digunakan oleh peralatan elektrik. Akhirnya fungsi ini akan kembalikan nilai jumlah unit yang digunakan oleh peralatan elektrik.

- Fungsi **`Calculate_bill`**. Fungsi ini akan mengira caj elektrik berdasarkan kepada tariff elektrik yang diberi di atas. Fungsi ini akan menerima suatu parameter iaitu jumlah unit yang digunakan oleh peralatan elektrik dan akhirnya fungsi ini kembalikan nilai caj penggunaan kuasa elektrik

- Fungsi **`Display_info`**. Fungsi ini akan memaparkan caj elektrik yang dikembalikan oleh fungsi **`Calculate_bill`**.

Berdasarkan kepada penerangan di atas, jawap berikutnya:

(i) Tulis kenyataan-kenyataan C++ yang betul untuk prototaip fungsi-fungsi berikut:

- `Accept_input`
- `Calculate_bill`
- `Display_info`

(3/100)

(ii) Tulis atur cara C++ yang lengkap untuk fungsi-fungsi berikut:

- `Accept_input`
- `Calculate_bill`
- `Display_info`

(15/100)

(iii) Diberi keratan atur cara `main()` C++ berikut:

```
main()
  {
     float total_units, electric_charge;
     …..
     …..
     total_units= _____// panggilan fungsi untuk fungsi Accept_input
     electric_charge= _____// panggilan fungsi untuk fungsi Calculate_bill
     _____// panggilan fungsi untuk fungsi Display_info

        …..
        …..
} // tamat main
```

Tulis kenyataan-kenyataan C++ yang betul untuk panggilan fungsi-fungsi di atas .

(5/100)

3. (a) (i) Tulis satu kenyataan C++ untuk menyediakan memori secara dinamik kepada satu tatasusunan yang tidak diketahui saiznya sehingga masa larian.

(ii) Tulis satu kenyataan untuk mengambil semula memori yang telah disediakan di bawah:

```
int* num = new int;

*num = 10;
```

(4/100)

(b) Apakah kandungan `myArray` selepas perlaksanaan kod berikut.

```
int ctr = 0;
int myArray[3];

for ( int i = 0; i < 3; i++)
{
   myArray[i] = ctr;
   ctr = ctr + i;
}
```

(3/100)

(c) Apakah output bagi setiap segmen atur cara berikut?

(i)
```
int num[3];

for ( int cnt = 1; cnt < 3; cnt++)
{
   num[cnt] = cnt + 1;
   cout << num[cnt];
}
```

(ii)
```
char string1[] = " How are you?";

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

(iii)
```
int ch = 100;
int * ptr = &ch;

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

(iv)
```
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] << " ";
   cout << endl;
}
```

(8/100)

(d) Nyatakan dan betulkan kesalahan(-kesalahan) bagi setiap soalan berikut:

(i) Gelung `for` perlu nilai awalkan semua nilai tatasusunan kepada -1:

```
int array [10];

for (int i  = 0; i < 9; i++)
   array[i] = -1;
```

(ii) Gelung `for` perlu cetak semua nilai tatasusunan:

```
int array [10];

for (int i  = 0; i <= 10; i++)
   cout << array[i];
```

(iii) Atur cara berikut memaparkan nilai terbalik bagi baris dan lajur tatasusunan 3 x 3:

```
int array[3][3] = {{1,2,3},{4,5,6},{7,8,9}};

for ( int I = 0; I < 3; I ++)
{
   for ( int j = 0; j < 3; j++)
      cout << array [i][j];
   cout << endl
}


contoh output :
       1 4 7
       2 5 8
       3 6 9
```

(5/100)

(e) (i) Tulis satu fungsi bernama `Reverse` yang menerima sebagai argumen satu tatasusunan yang bernilai apung dan saiz tatasusunan tersebut. Fungsi perlu mengterbalikkan nilai dalam tatasusunan.

```
contoh
tatasusunan input : 5.8  2.3  4.5  7.8
tatasusunan output : 7.8  4.5  2.3  5.8
```

(5/100)

(ii) Tulis satu kod segmen C++ yang akan

(A) mencipta tatasusunan 3 x 3 bernama `Array`.

(B) menilai awalkan tatasusunan yang diisytiharkan dalam (A) dengan nilai mengikut indeks baris:

```
Tatasusunan :  1 1 1
               2 2 2
               3 3 3
```

(C) Kemaskini tatasusunan dalam (B) dengan menambahkan nilai indeks baris kepada nilai asal.

```
Sebelum  : 1 1 1
           2 2 2
           3 3 3

Selepas  : 2 2 2
           4 4 4
           6 6 6
```

(iii) Jumlahkan setiap lajur dan simpan ke dalam tatasusunan satu dimensi bernama `Total_Col` dan jumlahkan setiap baris dan simpan ke dalam tatasusunan satu dimensi bernama `Total_Row`.

(10/100)