
UNIVERSITI SAINS MALAYSIA

Stamford College

First Semester Examination
2004/2005 Academic Session
October 2004

**External Degree Programme
Bachelor of Computer Science (Hons.)**

CPT101 – Principles of Programming

Duration : 2 hours

INSTRUCTIONS TO CANDIDATE:

- Please ensure that this examination paper contains **FOUR** questions in **ELEVEN** printed pages before you start the examination.
 - Answer **ALL** questions.
 - On each page, write *only your Index Number*.
-

1. (a) Given the following declaration, statement and input:

```
int num;
double value;
char letter;
cin >> num >> letter >> value;
```

input data: 12.34

What are the values stored in the memory?

(5/100)

- (b) Name **two (2)** categories of computer software.

(5/100)

- (c) Given the values for the boolean variable X, Y, and Z. Determine the values of the following expressions:

X = True, Y = False, Z = False

(i) !Y || (Z || !X)

(ii) Z || (X && (Y || Z))

(5/100)

- (d) What is the output of the following program segment?

```
int a = 6;
if (a > 0)
    switch (a)
    {
        case 1: a = a + 3;
        case 3: a++;
                break;
        case 6: a = a + 6;
        case 8: a = a + 8;
                break;
        default: a--;
    }
else
    a = a + 2;
cout << a;
```

(5/100)

- (e) List the **two (2)** types of while repetition control which reads and evaluates the condition before executing the statements.

(5/100)

- (f) Will all the repetitions end when the repetition condition becomes false?

(5/100)

- (g) How many times is this repetition repeated? Provide the output.

```
x = 5; y = 50;
do
    x = x + 10;
while (x < y);
cout << x << " " << y << endl;
```

(10/100)

- (h) What is the output of the following program segment?

```
int i, j;
for (i = 1; i <= 3; i++)
{
    for (j = 1; j <= (3 - 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;
}
```

(10/100)

- (i) What is received by the formal parameter from the actual parameter when the parameters are passed using reference variable to a function?

(5/100)

- (j) Give the output for the following statement:

```
enum sports {basketball, football, hockey, baseball,
            soccer, volleyball};
cout << hockey << endl;
```

(5/100)

- (k) Assume `list` is an array of type `int`. What is stored in `list` after the following program segment is executed?

```

for (j = 0; j < 5; j++)
{
    list[j] = 2 * j + 5;
    if (j % 2 == 0)
        list[j] = list[j] - 3;
}

```

(10/100)

- (l) What is the type of function used to initialise the member data in a class?

(5/100)

- (m) Provide one difference between structure and class.

(5/100)

- (n) Given the following structure segment. Indicate whether the statements are **VALID** or **INVALID**.

```

struct nameType
{
    string first;
    string last;
};
struct dateType
{
    int month;
    int day;
    int year;
};
struct personalInfoType
{
    nameType name;
    int ID;
    dateType dob;
};
personalInfoType person;
personalInfoType classList[100];
nameType student;

```

- (i) `person.name.first = "William";`
(ii) `cout << person.name << endl;`
(iii) `classList[1] = person;`
(iv) `classList[20].ID = 100001100;`

- (v) `person = classList[20];`
- (vi) `student = person.name;`
- (vii) `cin << student;`
- (viii) `for (int j = 0; j <100; j++)`
`classList[j].ID = 00000;`
- (ix) `classList.dob.day = 1;`
- (x) `student = name;`

(20/100)

2. (a) (i) Write **two (2)** program segments which differentiates the usage of sentinel controlled while loop and counter controlled while loop.
- (ii) Draw a flow chart which shows the operation of for loop.

(20/100)

- (b) What is the output of the following program segments?

(i)

```
for(int i=0;i<=10;i++)
{
    if(i%2)
        continue;
    cout<<i<<endl;
}
```

(ii)

```
for(int i=0;i<=10;i++)
{
    if(i==5)
        break;
    cout<<i+1;
}
```

(iii)

```
int i=0;
int total=0;
while(i<=5)
{
    ++i;
    total=total*(i-1);
}
cout<<total;
```

```
(iv) int i=0;
      while(i>=0)
      {
          cout<<i;
          i++;
      }
```

(40/100)

(c) Given the following formula to convert temperature from Celcius to Fahrenheit:

$$\text{Celcius} = \frac{5}{9} (\text{Fahrenheit} - 32),$$

Write a C++ program which will print to screen a list of temperature in Celcius for odd or even values between 32-212°F according to user's request. Use for loop and switch-case choice in your program.

(40/100)

3. (a) Given the following program segment:

```
void Fantasia (int, int &)
int main ()
{
    int mas = 3;
    long int lin = 1;
    Fantasia (mas + 200, lin);
    ...
}

void Fantasia (int bob, long int& zacc)
{
    ...
}
```

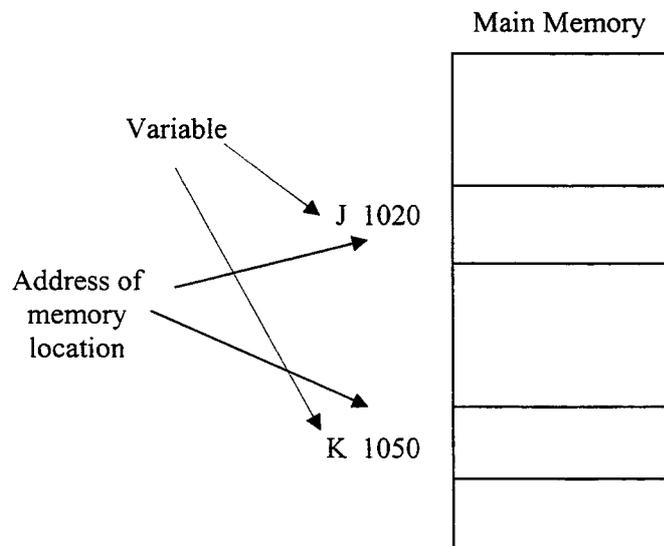
Indicate whether the following statements are **TRUE** or **FALSE**:

- (i) Fantasia function returns an integer value to the main function.
- (ii) The integer value of variable bob in Fantasia function can be used to send value from Fantasia function to the main function.

- (iii) Without using the return statement, Fantasia function can return a value to the main function.
- (iv) The value of variable `lin` can be modified by Fantasia function.

(24/100)

- (b) (i) Given the following diagram:



Write the declaration for the two variables above in C++ language so that variable `K` contains the value 1020, i.e. pointing to variable `J` of type integer. Then assign integer value 70 using pointer variable `K` so that variable `J` stores the value 70.

(16/100)

(ii) Given the following program segment:

```
int x;
int y;
..... // line 3: statement declaring variable p
         as a reference variable to x
..... // line 4: statement declaring variable q
         as a reference variable to y
*p=30;
*q=40;
cout << x << " " << y << endl;
x=*q;
y = *q + y;
cout << *p <<" " << *q << endl;
x=*p + *q;
*p=y + *p;
cout << *p <<" " << *q << endl;
```

Write the statements for line 3 and line 4. Give the output of the above program segment.

(20/100)

(c) Given the following program segment:

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

... Calculate(...); //function prototype
... Display(...); //function prototype

main ( )
{
    float v, i, ...;
    ...
    cout << "Enter the value for voltage and current: "
    cin >> v >> i;
    ... Calculate(...); //function call
    ... Display(...); //function call
}

//Function to calculate power and resistance
... Calculate(...) //function header
{
    ...
}

... Display(...) //function header
{
    ...
}
}
```

You are required to calculate the power consumed by a heater and the existing resistance using the following equation:

$$p = v * i \quad \text{dan} \quad R = v/i$$

that is

- p = power (watt)
- v = voltage (volt)
- i = current (ampere)
- R = resistance (ohms)

The program specification is as follows:

- Receive input from keyboard, i.e., voltage and current
- Display information on screen as in the following diagram:

Voltage = 110 volt and Current = 5.0 amperes
Power consume by the heater: 550 watts
Heater's resistance: 52 ohms

You are required to complete the above program segment using parameter passing to Calculate function and Calculate function will return the value for power and resistance to the main function. The Display function will receive the parameters using pointer variable and display them as shown in the above diagram.

(40/100)

4. The Tour de France is held every year. A group of cyclists will race for about a month throughout France. Everyday during the tour, the participants will race from one city to another city. The winning cyclist for that day will be crowned as the winner of that stage. Their times will be accumulated from day to day. The leader of the accumulated time is the overall leader of the tour and he will be wearing the famous yellow jersey the following day. The person who gets the yellow jersey after the race ends in Paris will be overall champion of the Tour de France.

Assume there are five participants who are taking part this year. Also there are 30 stages this year. Following is the result for the first stage from Liege to Charleroi (Note: Liege and Charleroi are in Belgium where the Tour de France 2004 started).

Participant	Time taken from Liege to Charleroi
Ali	1h 30m 55s
Baba	1h 28m 44s
John	1h 34m 38s
Mat	1h 28m 36s
Tut	1h 32m 22s

This means, Mat is the first stage winner. Since there is only one stage this far, he is also overall leader. He will be wearing the yellow jersey at the start of the second stage.

Following is the result for the first and second stage:

Participant	Time taken from Liege to Charleroi	Time taken from Charleroi to Namur
Ali	1h 30m 55s	1h 20m 39s
Baba	1h 28m 44s	1h 22m 51s
John	1h 34m 38s	1h 22m 15s
Mat	1h 28m 36s	1h 20m 50s
Tut	1h 32m 22s	1h 21m 37s

- (a) Declare a structure called `Time` to store time, i.e. hours, minutes and seconds.
(15/100)
- (b) Declare a two-dimensional array to store the time of the five participants for the 30 stages. You need to store only the time and it must be stored using the structure declared in 4(a). Add another column to the array to keep the total time for each participant.
(15/100)
- (c) Write a function which will allow the tour staff to input the time of each participant after each stage into the array declared in 4(b).
(20/100)
- (d) Write a function which will calculate the total time for each participant to decide the overall leader of the tour. The function only needs to calculate the total time until the indicated stage and store the total in the last column of the array for each participant.
(20/100)
- (e) Rewrite `Time` structure in 4(a) as a class.
(10/100)
- (f) Explain briefly the following term in the object oriented paradigm:
- (i) object
 - (ii) inheritance
 - (iii) polymorphism
 - (iv) private
- (20/100)