THE UNIVERSITY OF TRINIDAD & TOBAGO

FINAL ASSESSMENT/EXAMINATIONS
SEPTEMBER - DECEMBER 2016

Course Code and Title: PROG1004 – Computer Programming ICT

Programme: Bachelor of Applied Science in Computer Engineering

Date and Time: Thursday December 1, 2016 **Duration:** 3 Hours

1:00pm - 4:00pm

PLEASE READ ALL INSTRUCTIONS CAREFULLY BEFORE YOU BEGIN THIS EXAMINATION

Instructions to Candidates

1. **This paper has eight pages (including the current page) and seven questions.**
2. **You are required to answer All questions**
3. **Write the answer to each question in the Answer Booklet provided.**
4. **The mark for each question is given on the next page as well as at the top of the question.**
5. **You must return the question paper along with your answer booklet and other writing paper to the Invigilator at the end of the examination.**

Key Examination Protocol

1. Students please note that academic dishonesty (or cheating) includes but is not limited to plagiarism, collusion, falsification, replication, taking unauthorised notes or devices into an examination, obtaining an unauthorised copy of the examination paper, communicating or trying to communicate with another candidate during the examination, and being a party to impersonation in relation to an examination.

2. The above mentioned and any other actions which compromise the integrity of the academic evaluation process will be fully investigated and addressed in accordance with UTT's academic regulations.

3. Please be reminded that speaking without the Invigilator's permission is **NOT** allowed.

QUESTION	MARK
1	/ 6
2	/ 8
3	/ 8
4	/ 12
5	/ 12
6	/ 12
7	/ 12
TOTAL	/ 70

QUESTION 1 (6 marks)

A new passenger pick-up service is being introduced to Trinidad. Write a C program to calculate the fare a passenger must pay to a taxi.

The fare has a time component, a distance component and a basic charge. It is calculated as follows:

The base charge is $5 for any trip.

$1.50 is added for every km.

The nominal time for each trip is the time it would take if the vehicle were travelling at 30 km/h, that is, 0.5 km per minute or 1 km every two minutes.

Thus a trip of 10 km would have a nominal time of 20 minutes.

If the time taken for the trip in minutes is greater than the nominal time then $1.75 is added for every minute in excess of the nominal time.

Your task is to write a C program that accepts as input from the user the distance of a trip and the time it takes. It determines and outputs the fare which the passenger must pay.

Here are 2 worked examples.

(1) Distance = 12 km; Time = 10 minutes.

The fare	=	Basic Charge	+	Distance Component	+	Time Component
	=	5	+	12 * 1.50	+	0
	=	5	+	18	+	0
	=	$23				

(2) Distance = 12 km; Time = 30 minutes.

The fare	=	Basic Charge	+	Distance Component	+	Time Component
	=	5	+	12 * 1.50	+	(30 - 12 * 2) * 1.75
	=	5	+	18	+	10.50
	=	$33.5				

QUESTION 2 (8 marks)

What will be the output when the following segments of code are executed:

i.
```
x = 9;  y = 11;
if (x > 5 && y < 10)
    a = x + y;
else
    a = x - y;
printf_s ("a = %d", a);
```

ii
```
x = 9;  y = 11;
if ( !(x > 10 || y < 10))
      a = x + y;
else
      a = x - y;
printf_s ("a = %d", a);
```

iii.
```
int p  =  12;
int m = 5;
double   r ;
r = 12 / 5;
printf_s ("r = %lf", r);
```

iv.
```
int p  =  12;
int m = 5;
double   r ;
r = 12 / 5 * 1.0;
printf_s ("r = %lf", r);
```

QUESTION 3 (8 marks)

The following segments of code have some common errors. Rewrite the code without the errors. There may be no error, one or more than one error.

i.
```
double cost;
printf_s ("Enter the cost of the item: ");
scanf_s ("%f ",  cost);
printf_s ("The cost = %.2f\n\n, " Cost);
```

ii.
```
char response;

//some lines of code here.

if  (response = Y)          /*check to see if response is
                            character Y for yes.  */

     printf_s ("Thank you very much. Goodbye!);
```

QUESTION 4 (12 marks)

A function f(x) is given as follows :

$$f(x) = (x-1) - \frac{(x-1)^2}{2!} + \frac{(x-1)^3}{3!} - \frac{(x-1)^4}{4!} \ldots$$

Write a C programme that accepts as input the value x and applies the function to 15 terms to determine the output f(x).

QUESTION 5 (12 MARKS)

```
#include <stdio.h>
void main()
{
   char figure;
   double length, width, base, height, radius;
   double area;

   printf_s ("Enter figure:\n c-Circle, \n t-Triangle, \n r-Rectangle \n");
   scanf_s (" %c", &figure, 1);

   switch (figure)
   {
       case 'R':
       case 'r':   printf_s ("Enter length \n");
                   scanf_s ("%lf", &length);
                   printf_s ("Enter width \n");
                   scanf_s ("%lf", &width);
                   area = length * width;
                   break;

       case 'T':   printf_s ("Enter base \n");
       case 't':   scanf_s ("%lf", &base);
                   printf_s ("Enter height \n");
                   scanf_s ("%lf", &height);
                   area = 0.5 * base * height;
                   break;

       case 'C':
       case 'c':   printf_s ("Enter radius \n");
                   scanf_s ("%lf", &radius);
                   area = 3.14 * radius * radius;

       default:
                   printf_s ("Incorrect figure \n");
                   break;
   }
   printf_s ("Area = %8.2lf \n", area);
}
```

The program above compiles successfully but yields correct results for rectangles but yields wrong results for other input when run.

i. Identify three possible runtime errors in this program.
ii. What changes would you make to the code to fix each of these errors?
*You **DO NOT** need to rewrite the entire program.*

QUESTION 6 (12 marks)

This problem requires the use of the nested if construct as well as the validation of input.

A shipping company is packing items into barrels and sending them off to various clients abroad. It needs to determine the weight of each barrel. The company also needs to know the minimum and maximum weights as well as the average weight of barrels it ships. This information will help the company make decisions in the future about shipping and handling.

Your program must read in, from the user, a barrel's id (integer). After entering the id of the barrel, it should read in the weight of an item for the barrel. Their might be more than one item for the barrel. Your program should therefore ask if there are any more items, e.g.

Any more items – Y / N?

If the response is positive, then ask for the weight of the next item. As the weight of items are entered, your program should keep a running total of the weight of these items.

If the response is negative, your program should output the barrel's id and the total weight of all the items in that barrel.

At this point, you need to check if the weight of this barrel is the heaviest or the lightest thus far. You should also use a counter to keep track of the number of barrels and an accumulator to keep a running total of the total weight of all the barrels so far which would be used to determine the average weight of each barrel.

After processing the data for one barrel, your program should then prompt the user for more barrels. This prompt should be:

Any more barrels – Y / N?

If the response is 'Y', then your program should repeat the process described above. Continue this process as long as the response is 'Y'.

If the response is 'N', then the program should output the number of barrels, the average weight of a barrel, the maximum weight of a barrels and the minimum weight of the barrels.

Question 6 continued

Your program needs to validate the inputs, so if the user enters an invalid response (when entering 'Y' or 'N'), then she is forced to re-enter it until it is valid.

Even though we have been using uppercase for all character data entry above, your program must be able to accept this data in either uppercase or lowercase. We are looking for the most efficient way to handle this requirement.

Use response controlled loops for prompting for more input for items as well as for prompting for more barrels. Your program should also validate the responses to these questions.

QUESTION 7 (12 marks)

A clerical officer wishes to have a C program that assists her in getting information about products and services at her organisation.

The program will use an array that keeps information on the price of 20 products as declared below.

```
int price [20];
```

(Note that you do not have to write the entire program for this question.)

a. Write the lines of code that allows the officer to enter the price of each product so that it is stored in the array.

b. Write the line of code that will display the price of the 5th product stored.

c. Write code that will increment the price of each product by 15%.

d. Write code that finds the price of the cheapest product stored.

e. Write code that will determine and output the average price of a product from this company.

f. Write the line of code that displays the price stored in the last location in the array.

[2 marks each]

END OF EXAMINATION