Rajarata University of Sri Lanka

Faculty of Applied Sciences

B.Sc.(Information Communication Technology) Degree

First Year Semester I Examination – April/May 2015

Principles of Program Design and Programming – ICT1402

(Theory)

Answer any five (05) questions
Time allowed: **Three hours**
Use C language where necessary

1) i. How do you determine the problem requirements? (04)
ii. Illustrate **repeat until** and **while loop** using flowcharts (04)
iii. An algorithm is independent of both hardware and programming language. Do you agree with this statement? Justify your answer. (04)
iv. Formally define what an algorithm is? (04)
v. Briefly describe two problem solving strategies you know (04)

2) i. Compare and contrast flowcharts and pseudocode in algorithm designing. (04)
ii. Examine the following algorithm:

algoX(INTEGER x)
1. r ← 0, p ← x
2. **while** (p > 0)
3. m = p **mod** 10;
4. p = p / 10;
5. r = r * 10 + m;
6. **print** r;

Rewrite the above algorithm using **repeat ... until** loop. (04)
iii. Express the above algorithm using a flowchart. (04)
iv. What is the purpose of above algorithm? (04)
v. Write a C function to implement above algorithm (04)

3) i. Correct the errors in following C program

```
void main()
{
      integer p,q,r,s,t;
      printf("Enter four integers")
      scanf("%i,%i,%i,%i", p,q,r,s)
      if(p>q OR r>s)
            t=p, p=q, q=t;
            t=r, r=s, s=t;
      for (t==p, p>=q, p++)
            printf("p, q, r, s", p, q, r*p, s*q)
            q++,r++,s++;
      return void(0);
}
```

(05)

ii. Correct the following while loop and rewrite using for loop

```
i=0, j=10;
while(i<=10 AND j>=1)
      printf("\n ixj=i*j", I,j, i*j");
      i++, j--;
```

(04)

iii. Compare and contrast the **for loop** and **while loop**. Explain situations where you can use **for loop** and **while loop**. (03)

iv. What are the precautions you must have with a while loop? (03)

v. Assume that a bank maintains five types of saving accounts identified by A, B, C, D, and E. The interest rates for each type are A:5%, B:4.5%, C:5.5%, D:6%, E:5.2%. Additionally 50% bonus interest is paid for types C and D if the balance is 100,000.00 or more. Write a C program to read account type, and balance and then calculate the interest. (05)

4) i. What is the class of a variable? Explain using examples. (03)

ii. Discuss the different ways of passing parameters to a function. (04)

iii. Write a C function that accepts an array of integers and reverses the contents. Note that the changes made within the function to the array must be visible to the main program. (06)

iv. The following is a recursive function to calculate n^{th} term of the Fibonacci series.

```
int fibbo(int n)
{
if(n==0)
      return 0;
if(n==1)
      return 1;
return  fibbo(n-1)+ fibbo(n-2)
}
```

(04)

Rewrite above function using for loop

v. Evaluate following C statements and write value of variable x;

a. i=10; x=1; ++x+=i;

b. byte a[]={5,10,15,20}; x=*a+*(a+1);

c. char p[]={'S','A','D','T'}; char x[]="PWC"; strcat(p,x); (03)

5) i. Define what a structure in C is, and discuss the advantages of using structures. (04)

ii. Discuss the difference between keywords **struct** and **typdef struct** (04)

iii. Define a C structure that allows to store following data about employees in a department;
name: Maximum 20 characters
DoB: Has three integer parts, date, month and year
employee_no: A positive integer
basic_salary: A real number
experience: A small integer (04)

iv. Write a C function to read and return an employee record (04)

v. Write a C function to print the information about most experienced employee, assuming that you have an array of employees. (04)

6) i. Compare and contrast macros and functions in C (04)

ii. What are the pitfalls in macros in C? Discuss how to overcome those using examples. (04)

iii. Define a parameterized macro to calculate and return the volume of a cylinder. (volume= PI*r*r*h; PI=3.142857) (04)

iv. In C, a file is simply a sequential stream of bytes. Identify the purpose of following operators/function in file handling. Give one example for each;

a. fopen()
b. fprintf()
c. fscanf()
d. getc()
e. feof()

v. Explain usage and purpose of following file opening modes. (05)

a. r
b. r+
c. w+

(03)