UNIVERSITY OF RUHUNA

BACHELOR OF COMPUTER SCIENCE (GENERAL) DEGREE LEVEL I (SEMESTER I)

EXAMINATION – JULY 2016

COURSE UNIT: CSC 1113 – Programming Techniques TIME: 2 hours

Answer all four questions.

1.

a.

i. What is meant by "***static***" keyword?

ii. Explain the purpose of using static variables in C programming?

iii. Write down the expected output of the following program.

```
#include <stdio.h>
    int z=0;
    int f( int x,int m) {
        int static kk=9;
        x=x+2;
        z=z+1+m;
        kk=kk+x;
        printf("inside function f:  %d %d %d \n", x,kk,z);
        return x+z;

    }

    int main() {
         int k=3,r=0,m=5;
        printf("1 line : %d %d %d \n",k,r, z);
        z=f(k,r);
        printf("2 line : %d %d %d \n",k,r, z);
        z=f(m,r);
        printf("3 line :  %d %d %d \n",m,r,z);
        return 0;

    }
```

b.

i. Suppose you have been asked to perform set of operations according to the operator user entered. For example, if the operator is "+", it supposes to add two integer numbers or if the operator is "*", it supposes to multiply two integer numbers. What is the best control structure to implement the above functionality? Justify your answer.

ii. Write a simple code segment to implement simple calculations using the following operators: +, -, /, *. Program allows user to enter two integer numbers and the operator.

c. Write down the expected outputs for the following loops.

i.
```
for(j=3; j<=15;j*=3){
        printf("%d\n",j);
}
```

ii.
```
for(i=50;i>0;i=i-10){
        printf("%d\n",i);

}
```

2.

a.

i. Explain the importance of arrays using an example.

ii. Declare an array to insert 20 integer values.

iii. Write a C program segment to insert and display the data in the array declared in 2.a.ii.

iv. Modify the above program in 2.a.iii to display only the integers which are greater than two-third (2/3) of the average value of the integers stored in the above array.

b. Assume there is a file named "testfile.txt" stored in the working directory of your computer containing some lines of text. Write a C program code segments to perform the following tasks.

i. Open the file for reading and appending a text purpose.

ii. If file is not null, then read the content in the file and display in the screen.

iii. Append the line "Hello C" to the file.

iv. Close the file.

3.

a.

i. Describe the characteristics of following functions.
   - User defined functions
   - Predefined functions
   - Recursion functions

ii. In a bank saving's account interest amount for a month is calculated as follows,

Interest amount= balance amount*(annual interest rate/100)*(1/12)

To implement the above calculation, write a C program function called ***calcInterest().***

Note:
- The function has two arguments ***BalanceAmount*** and ***AnnualInterestRate.***
- The function should return the calculated interest amount.

iii. Call the function ***calcInterest()*** in a main program.

b.

i. Explain the term **"Dereferencing"** using an example.

ii. Write an appropriate code segments for each of the following functionalities.
- Declare a pointer to the function ***int func1(int x, float y).***
- Initialize the pointer you declared above.
- Call the function using pointer variable.

iii. Explain the meaning of numbered lines (1, 2 and 3) in the following program code.

```
#include<stdio.h>
power(int**);  <-------  1
int main()
{
   int a=5, *aa; /* Address of 'a' is 1000 */
   aa = &a;  <-------  2
   a = power(&aa);
   printf("%d\n", a);
   return 0;
}
power(int **ptr)
{
   int b;
   b = **ptr * **ptr;  <-------  3
   return (b);
}
```

iv. Write down the expected output of the above program.

4.

a. State two advantages of using structures over arrays in a C program.
b. Explain the following terms giving suitable examples.

   i. Nested structures
   ii. Array of structures

c. List three approaches that can be used to pass structures as function arguments and state the most efficient approach giving reasons.

d.

   i. Define a structure named *point* to describe a point in XY coordinate system. The point has an x coordinate and y coordinate, both are integers.
   ii. Use point structure defined above to define a structure named *rectangle* assuming a rectangle is represented using a pair of diagonally opposite corner points of the rectangle.
   iii. Write a C function to create a point that takes x and y coordinates as input arguments and returns a structure point.
   iv. Write a C function that takes two point structures as arguments and return the distance between the points.
   When the coordinates of two points are given the distance D between the points is calculated as follows:

$$D = \sqrt{dx^2 + dy^2}$$

   where dx is the difference between the x-coordinates of the points and dy is difference between the y-coordinates of the points.

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