CS101 Introduction to Computing
Indian Institute of Technology, Patna
Mid Semester Examination
February, 2014

Answer all the questions **FM: 60** **Time 2 hours**

Q1. Answer the following questions (10 x 2 =20)

a. The three parts of the loop expression in the **for loop** are:
   the ..... expression
   the ..... expression
   the ..... expression

b. A do-while loop is useful when we want that the statements within the loop must be executed:
   i. Only once ii. At least once iii. More than once iv. None of these

c. Which keyword is used to take the control to the beginning of the loop? Which keyword is used to exit from a loop?

d. In what sequence the initialization, testing and execution of body is done in a **do-while** loop
   i. Initialization, execution of body, testing
   ii. Execution of body, initialization, testing
   iii. Initialization, testing, execution of body
   iv. None of the above

e. State whether the following statements are true or false
   i. The variables commonly used in C functions are available to all the functions in a program.
   ii. The same variable names can be used in different functions without any conflict.

f. You want to test whether 3 variables a, b, and c are in an increasing sequence. Will the code if(a<b<c) printf("Yes"); else printf("False"); give the correct result. Explain your answer.

g. Consider 2 code snippets given below. State the output of the 2 codes and provide a brief explanation of the same.

Code 1:	main()	**Code 2:**	main()
void func1(int b)	{	void func2(int b[ ])	{
{	int a[1]={2};	{	int a[1]={2};
b=5;	func1(a[0]);	b[0]=5;	func2(a);
}	printf("%d", a[0]);	}	printf("%d", a[0]);
	}		}

h. What is the difference between an extern and static identifier? Explain with an example.

i. I am given an array *a*[100] that contains a sequence of 100 numbers having a range of values from 0 to N. I want to create an array *count*[N+1], where the k^{th} element of this array will represent the number of elements in a that is lesser than *k*. I write the code for this as follows.

```
findFreq(int a[ ], int N)
{
int i;
int count[N+1] = {0};   // Initializes all elements of count to 0
for(i=0;i<100;i++)
        count[a[i]]++;
}
```

Check the logical correctness of the code. Suggest suitable modifications if required.

j. Suppose a=1, b=2, c=3, d=4. What would the C expression p=a+++b*++c-(d<a++) return? What would be values of a, b and c?

Q2. State the outputs of the following programs (5 x 2 =10)

a.

```
#include <stdio.h>
void fun(int,int);
int main ()
{
int i=5, j=2;
fun(i,j);
printf("%d %d\n",i,j);
return 0;
}
```

```
void fun (int i, int j)
{
i=i*i;
j=j*j; }
```

b.

```
#include<stdio.h>
int main()
{
func();
func();
return 0;
}
```

```
void func()
{
auto int i=0;
register int j=0;
static int k=0;
i++;j++;k++;
printf("%d %d %d\n",i,j,k);
}
```

c.

```
#include <stdio.h>
int main()
{
int a[5]={5,1,15,20,25};
int i,j,k=1,m;
i=++a[1];
j=a[1]++;
m=a[i++];
printf("%d %d %d\n",i,j,m);
}
```

d.

```
#include<stdio.h>
int main()
{
int c=3;
switch(c )
        {
        case '3':
          printf("Option 1");
          break;
         case 3:
           printf("Option 2");
          break;
        default:
          printf("Option 3");
        }
return 0;
}
```

e.

```
#include <stdio.h>
int main()
{
int x=4,y=0,z;
while(x>=0)
        {
          if(x==y)  break; else printf("%d %d\n",x,y);
        x--; y++;
        }
return 0;
}
```

Q3. Point out if the following codes have syntax (not logic) errors. More than one error can also be present. (5 x 2 =10)

a.
```
main()
{
int a=10, b;
a>=5?b=100:b=200;
printf("%d", b);
}
```

b.
```
main()
{
int a=10, b;
(double)b=(double)a;
b++;
printf("%d\t%d\n", b, a);
}
```

c.
```
int max(int a[ ])
{
int p=-9999, i;
for(i=0;i<5;i++)
   if(p>a[i])
       max=a[i];
return p;
}
main()
{
int b[5]={1,4,2,5,3}, p;
p=max(b[ ]);
printf("%d", p);
}
```

d.
```
main()
{
int p,q, r, sum;
scanf("%d  %d  %d", p, q, r)
sum =p+=++q+r++;
printf("%d\t%d\t%d\t%d", p,q,r,sum);
}
```

e.
```
main()
{
int i, a=1,b=3;
i=a+=2, 5, a+b;
printf("%d\t%d\t%d", a, b, i);
}
```

Q4. Write C codes for the following

a. Write a program to find the Highest Common Factor of 2 numbers. (6)

b. You are given a random sequence of 100 numbers, ranging from 0 to 9 in an array *a*[100]. You are supposed to write a function int findMatchingSeq(int *a*[ ]) that does the following activities.
   a. Takes as input from user a sequence of N numbers between 0 and 9. We name this input sequence as *inpSeq*.
   b. Scans the array *a* to find number of occurrences of the sequence, *inpSeq*.
   Example:
   a = {1, 1, 1, 1, 3, 5, 1, 1, 1} and inpSeq = {1, 1, 1}. Then the number of occurrences of inpSeq is 3. (8)

c. Write a recursive function to calculate the product of N consecutive even natural numbers, starting from any even number provided by the user. Example, if the starting number is 6 and N = 4, then you require to find 6 x 8 x 10 x 12. (6)