Indian Statistical Institute

Computer Science I – Mid-semester Examination

Part I:

Answer the following questions on paper.

1. What will be printed as the result of the following program piece?

```
#include <stdio.h>

main()

{
     int x=20, y=35;
     x = y++ + x++;
     y = ++y + ++x;
     printf("%d, %d\n", x, y);
}
```

2. For n=2, what does the following function return?

```
int fn(int n)
{
for(i=1,i<=n,i++)
     for(j=i,j<=i,j++)
     sum = sum+j;
     return(sum);
}
```

3. What is the difference between the following two declarations?

```
char *a="Hello World";
char a[]="Hello World";
```

4. What will be printed as the result of the following piece of C code?

```
main()
{
char *ptr = “Computer Science”;
*ptr++;
printf(“%s\n”, ptr);
ptr++;
printf(“%s\n”, ptr);
}
```

5. The following program sorts an array of numbers. Explain the sorting algorithm implemented by this program in detail. Use an example to illustrate your explanation.

```
void sort(char *v[], int left, int right)
{
     int i, last;
     void swap(char *v[], int i, int j);

     if (left >= right)
          return;
     swap(v, left, (left+right)/2);
     last = left;
     for (i= left+1; i <= right, i++)
          if (strcmp(v[i], v[left] < 0)
               swap(v, ++last, i);
     swap(v, left, last);
     sort(v, left, last-1);
     sort(v, last+1, right);
}

void swap(char*v[i], int I, int j)
{
     char *temp;

     temp = v[i];
     v[i] = v[j];
     v[j] = temp;
}
```

Part II

Write programs in C to answer the following questions.

1. Write a C program that will print the following output on screen.

   1
   22
   333
   4444
   55555

2. Write a C program using a recursive function that prints the following output on screen.

   9876543210

3. Write a C program that will compute the number of seconds in a year. The program should take into account leap years too.

4. The Towers of Hanoi is a mathematical game or puzzle. It consists of three rods, and a number of disks of different sizes which can slide onto any rod. The puzzle starts with the disks neatly stacked in order of size on one rod, the smallest at the top, thus making a conical shape.

   The objective of the puzzle is to move the entire stack to another rod, obeying the following rules:

- Only one disk may be moved at a time.
- Each move consists of taking the upper disk from one of the pegs and sliding it onto another rod, on top of the other disks that may already be present on that rod.
- No disk may be placed on top of a smaller disk.

There will always be a spare rod amongst the three rods that can be used to store disks that are being moved from one to another.

Write a C program that will illustrate a recursive solution to the Towers of Hanoi puzzle.