	INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR	**Stamp/Signature of the Invigilator**

EXAMINATION (Mid Semester)											**SEMESTER (Autumn)**	
Roll Number											**Section**	
Name												
Subject Number	**C**	**S**	**1**	**0**	**0**	**0**	**1**		**Subject Name**		***Programming & Data Structures***	
Department/Centre of the Student												

Important Instructions and Guidelines for Students

1. You must occupy your seat as per the examination schedule / sitting plan.
2. Do not keep mobile phones or any similar electronic gadgets with you even in the switched off mode.
3. Loose papers, class notes, books or any such materials must not be in your possession, even if they are irrelevant to the subject you are writing examination.
4. Data book, codes, graph papers, relevant standard tables/charts or any other materials are allowed only under the instruction from the paper-setter.
5. Use the instrument box, pencil box and non-programmable calculator is allowed during the examination. However, exchange of these items or any other papers (including question papers) is not permitted.
6. **You must clearly write your roll number, name and section (11 to 20) on this front page of the answer book.**
7. **Write the answers only on the space provided and do not tear off any page. Use the last page(s) of the answer script for rough work.** Report to the invigilator if the answer script has torn or distorted page(s).
8. It is your responsibility to ensure that you have signed the Attendance Sheet. Keep your Admit Card / Identity Card on the desk for checking by the invigilator.
9. You may leave the examination hall for washroom or for drinking water for a very short period. Record your absence from the examination hall in the register provided. Smoking and consumption of any kind of beverages are strictly prohibited inside the examination hall.
10. Do not leave the examination hall without submitting your answer script to the invigilator. **In any case, you are not allowed to take away the answer script with you.** After the completion of the examination, do not leave the seat until the invigilators collect all the answer scripts.
11. During the examination, either inside or outside the examination hall, gathering information from any kind of sources or exchanging information with others or any such attempt will be treated as '**unfair means'**. Do not adopt unfair means and do not indulge in unseemly behavior.

Violation of any of the above instructions may lead to severe punishment.

Signature of the Student

To be filled in by the Examiner

Question Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Marks obtained											

Marks obtained (in words)	**Signature of the Examiner**	**Signature of the Scrutinizer**

INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

Date: 20/09/2019 FN **Time: 2 hours** **Full marks: 60** **No. of students: 800 (approx.)**

Autumn Mid Semester Exams, 2019 **Dept: Computer Science and Engineering** **Sub No: CS10001**

B.Tech. 1st Year **Sub Name: Programming and Data Structures**

Instructions: ***Answer all questions in the spaces (box or fill-in-the-blank) provided. For rough work, you may use the extra pages provided in this booklet. No other supplementary sheets will be provided.***

Q1. Answer the following.

(a) Fill in the blanks (for appropriate operations mentioned in brackets): **[4 marks]**

```
_____________________      // Include a header file for I/O operations

int main()
{
   float x;
   int   z;

   printf ("Enter the value of x \n");

   scanf ("_____________", ___________x);     // For scanf

   z = _________________ (x / 12.5);          // Type-cast

   printf ("z=%d \n", z);
}
```

(b) What will be printed by the following code segments? **[4 x 2 = 8 marks]**

(i) Code segment 1:

```
printf ("expr=%d \n", 0 || 0 % 10 >= 0 && 30 % 10 < 3);
```

Q1(b)-(i):

(ii) Code segment 2:

```
int x = -5;
int y = 0;
if (y = x + 5)
  {
     x = 1;
     y = 2;
  }
else
  if (y < 0)  x = (x) * (-1);
  else  x = 2 * x;
        printf ("x=%d  y=%d \n", x, y);
```

Q1(b)-(ii):

(iii) Code segment 3:

```
int i=0, j=20, x;
x = i++ + ++j;
printf ("x=%d, i=%d, j=%d \n", x, i, j);
```

Q1(b)-(iii):

(iv) Code segment 4:

```
char c = 'r';
switch (c)
  {
     case 'w':  printf ("White \n");
     case 'r':  printf ("Red \n");
     case 'b':  printf ("Blue \n");
     case 'g':  printf ("Green \n");
                break;
     case 'y':  printf ("Yellow \n");
     default:
                printf ("Other \n");
  }
```

Q1(b)-(iv):

Q2. Answer the following.

(a) What will be the output of the following program? **[2 marks]**

```
#include <stdio.h>
int main()
{
  int i = 5, j = 6, k = 7;
  if(i > j == k)
     printf("%d %d %d", i++, ++j, --k);
  else
     printf("%d %d %d", i, j, k);
  return 0;
}
```

Q2(a):

(b) Identify the error(s) in the following program? **[2 marks]**

```
#include <stdio.h>
void main()
{
     short day=2;
     int switch(day)
     {
          case 2: || case 22:
               printf ("%d nd", day);
          break;
          default:
               printf ("%d th", day);
          break;
     }
}
```

Q2(b):

(c) What will be the output of the following program? **[5 marks]**

```
#include <stdio.h>
int fun();
int main()
{
    for (fun(); fun(); fun()) {
        printf("%d ", fun());
    }
    return 0;
}
int fun()
{
    int static num = 10;
    return num--;
}
```

Q2(c):

(d) What will be the output of the following program? **[3 marks]**

```
#include <stdio.h>

int main()
{
    struct xyz {
      int a;
    };

    struct xyz obj1 = {1};
    struct xyz obj2 = {12};
    obj2 = obj1;
    printf ("%d", obj2.a);
    obj2.a = 100;
    printf ("%d", obj1.a);
}
```

Q2(d):

Q3. Answer the following.

(a) What is the output of the following program? **[4 marks]**

```
int f (int n) {
      static int s = 0;
      int d;
      while (n) {
            d = n % 10;   s = s + d;   n /= 10;
      }
      return s;
}

int main( ){
      printf ("\n %d", f(2516) );
      printf ("\n %d", f(3387) );
}
```

Q3(a):

(b) See the code below for function **changeArr()** that takes as argument an integer array (**a**) and number of elements (**n**) in the array. The function changes the array as follows -- every positive even element is increased by 1, every positive odd element is decreased by 1, and zero or negative elements are left unchanged. The function uses one pointer variable (**p**) to access the array elements. Fill in the blanks in the code, so that the function operates correctly.

[2+2+2+1+1 = 8 marks]

```
# void changeArr (int *a, int n)
{
      int *p;
      p = a;

      while ( ____________________________ ) {

            if ( ____________________________________ ) {
                        // positive even element – increase by 1

                  (*p)++ ;
            }
            else if ( ____________________________ ) {
                        // positive odd element – decrease by 1

                  __________ - - ;
            }
            ________________ ;  // increment for next iteration

      }     // end while

}
```

Q4. Answer the following.

(a) For the following function **func1(x,y)**, what will be the value of **func1(4,3)**? **[2 marks]**

```
int func1 (int x, int y)
{
if (x == 0) return y;
return func1(x - 1,  x + y);
}
```

Q4(a):

(b) What does the following function print for n = 25? **[2 marks]**

```
void func2(int n)
{
  if (n == 0)return;
  printf ("%d", n%2);
  func2(n/2);
}
```

Q4(b):

(c) In terms of the parameters **x** and **y**, what does the following function compute? **[2 marks]**

```
int func3 (int x, int y)
{
    if (y == 0)   return 0;
    return (x + func3(x, y-1));
}
```

Q4(c):

Options: (i) x+y, (ii) x-y, (iii) x*y, (iv) x%y, (v) None

(d) Given an array of integers, print sums of all subsets in it. Output sums can be printed in any order.

Examples: `Input : arr[] = {1,2}  Output: 0 1 2 3`

`Input : arr[] = {1,2,5}  Output : 0 1 2 5 3 6 7 8`

Fill in the blanks in the code, so that the program operates correctly. **[6 marks]**

```
#include <stdio.h>
#include <stdlib.h>

void subsetSums (int arr[], int left, int right, int sum){
      if (left > right) {
            printf ("%d\t",_____________);
            return;
      }
      subsetSums (arr, left+1, _____________ , _____________);

      subsetSums (arr, _____________, right, sum);
}

int main() {
      int n, i, arr[100];
      printf ("\nEnter the number of elements in the set");
        scanf ("%d",&n);
      for  (i=0;i<n;i++) {
            printf ("\narr[%d] = ", i);
            scanf ("%d", &arr[i]);
      }
      subsetSums (arr, 0,_____________ , _____________);
      return 0;
}
```

Q5. Answer the following.

(a) It is required to read a character string containing only upper-case alphabetic characters and blank spaces from the keyboard. Then, for a given value of an integer k, every alphabetic character is replaced by the k-th next alphabetic character. It is assumed that in counting the k-th next alphabet, the letter 'A' comes after 'Z'. For example, with the value of k as 3, the string "HAPPY BIRTHDAY TO YOU" will be replaced by "KDSSB ELUWKGDB WR BRX".

Fill in the blanks in the code, so that the program operates correctly. **[2+1+2+2 = 7 marks]**

```
#include <stdio.h>
#include <string.h>
int main()
{
  int i, k;
  char message[50];
  scanf ("%d ", &k);
  printf ("\nEnter the string: ");

    scanf ("%____________________", message);

  for (i=0; i<_____________________________; i++)
  {
    if ((message[i] >= 'A') && (message[i] <= 'Z')) {

      message[i] = ____________________________________;
      if (message[i] > 'Z')

        message[i] = ____________________________________;
    }
  }
  printf ("\nModified string: %s", message);
}
```

(b) In the following program, the function **guess** takes an integer array **X** and its size **N** as parameters, and writes into another integer array **Y** (also passed as parameter), such that for values of **index** from **0** to **N-1**, **Y[index]** will contain the number of elements in array **X** that are greater than **X[index]**. Fill in the blanks in the code, so that the program operates correctly. **[1+2+2 = 5 marks]**

```
#include <stdio.h>
void guess (int N, int X[], int Y[])
{
  int i, j, count;
  for (i=0; i<N; i++) {

    _____________________;
    for (j=0; j<N; j++)

      if (_____________________) count++;

    _____________________;
  }
}

int main()
{
  int i, n, old[20], new[20];
  printf ("\nNumber of elements: ");
    scanf ("%d", &n);
  printf ("\nEnter the elements: ");
  for (i=0; i<n; i++)
    scanf ("%d", &old[i]);
  guess (n, old, new);
  printf ("\nNew array: ");
  for (i=0; i<n; i++)
    printf ("%d ", new[i]);
}
```

ROUGH WORK

ROUGH WORK

ROUGH WORK

ROUGH WORK