INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR		
		Stamp / Signature of the Invigilator
EXAMINATION (Class Test - 1)		**Full Marks - 30**

Roll Number										**Section**		**Name**
Subject Number	C	S	1	0	0	0	1	**Subject Name**	*Programming and Data Structures*			
Department / Center of the Student										**Additional sheets**		

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 Scrutineer**

Answer all the Questions. Write the answers in the boxes only. You can use the designated spaces for rough works.

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1. Determine the normalized number from the given single precession floating point representation. The normalized number is represented as $(-1)^s \times 1.(mantissa) \times 2^{exponent}$. Determine each component and show the number in the format mentioned above. **[4]**

   10111010101101111010000000000000

2. Answer the following questions: **[9]**

   (a) (2 marks) Write a condition which will be true if *any pair* of the `int` variables `x, y, z` are equal to each other, false otherwise.

   (b) Consider the following program:

```
#include <stdio.h>
int main() {
    char a='s'-'g',b='U'-'L';
    int c;
    scanf("%d",&c);
    if(c>a) printf("First condition\n");
    if(c<b) printf("Second condition\n");
    else printf("Third condition\n");
}
```

(2 marks) Write the output if the input value of the variable `c` is 3.

(c) (3 marks) In the above program, what is the range of input `c` for which the output is "`Third condition`"?

(d) (2 marks) Write the output of the program for input value of the variable $c = 2$.

```
#include <stdio.h>
int main() {
    int c;
    scanf("%d",&c);
    switch(c) {
        case 2-1: printf("One\n");
        case 1+1: printf("Two\n");
        default: printf("Default\n");
    }}
```

3. What will be printed by the following program? **[5]**

```
#include <stdio.h>
int main() {
   int a = 10, b = 3, c, d, i = 20, j = 30, x;
   x = a / b;
   c = x++;
   d = x / c;
   d++;
   i *= ++c;
   j /= i++;
   printf("x = %d c = %d d = %d i = %d j = %d", x, c, d, i, j);
   return 0;
}
```

4. The following code computes the prime factorization of a number $a\,(\geq 2)$ given as input. For example, if $a = 72$, it will print: `Prime factorization = 2 x 2 x 2 x 3 x 3`. Fill up the blanks in this code. **[5]**

```
#include <stdio.h>
int main(){
  int a, d = 2;
  printf("Enter a positive integer: ");
  scanf("%d", &a);
  printf("Prime factorization = ");
  do{
    if (_______________){ // 1.5 marks
      printf("%d x ", d);

      _______________;   // 2 marks
    }
    else
      _______________;   // 1.5 marks
  }
  while(a >= d);
  printf("\b\b \b\b.\n");
  return 0;
}
```

5. For the C program given below, what will be the output for the input 1234 5678 f (three data items with two spaces in between) are given? **[5]**

```
#include <stdio.h>
int main() {
int a,b;
char c;
printf("Enter the values of a, b, c:");
scanf("%2d%3d%c",&a,&b,&c);
printf("a = %d\n b = %d\n c = %c\n",a,b,c);
scanf("%2d%3d%c%c",&a,&b,&c,&c);
printf("a = %d\n b = %d\n c = %c\n",a,b,c);
return 0;
}
```

6. What is the output of the following program? **[2]**

```
#include <stdio.h>
int main() {
double x = 123456789.99;
int y = x;
printf("y = %d\n y = %0.2lf\n", y, (double)y);
return 0;
}
```

Space for Rough Work

1. Determine the normalized number from the given single precession floating point representation. The normalized number is represented as $(-1)^s \times 1.(mantissa) \times 2^{exponent}$. Determine each component and show the number in the format mentioned above. **[4]**

   10111010101101111010000000000000

   Ans:
   Sign bit = 1
   Mantissa = 01101111010000000000000 (last 23 bits)
   Exponent = 117 - 127 = -10
   Normalized Number = $(-1)^1 \times 1.0110111101 \times 2^{-10}$

2. Answer the following questions: **[9]**

   (a) (2 marks) Write a condition which will be true if *any pair* of the `int` variables `x, y, z` are equal to each other, false otherwise.

   ```
   ((x==y)||(y==z)||(x==z))
   ```

   (b) Consider the following program:

   ```
   #include <stdio.h>
   int main() {
       char a='s'-'g',b='U'-'L';
       int c;
       scanf("%d",&c);
       if(c>a) printf("First condition\n");
       if(c<b) printf("Second condition\n");
       else printf("Third condition\n");
   }
   ```

   (2 marks) Write is the output if the input value of `c` is 3.

   Second condition

   (c) (3 marks) In the above program, what is the range of input `c` for which the output is "`Third condition`"?

   $9 - 12$

   (d) (2 marks) Write the output of the program for input value of the variable $c = 2$.

   ```
   #include <stdio.h>
   int main() {
       int c;
       scanf("%d",&c);
       switch(c) {
           case 2-1: printf("One\n");
           case 1+1: printf("Two\n");
           default: printf("Default\n");
       }
   }
   ```

   Output for $c = 2$: Two
   Default

3. What will be printed by the following program? **[5]**

```
#include <stdio.h>

int main() {
   int a = 10, b = 3, c, d, i = 20, j = 30, x;
   x = a / b;
   c = x++;
   d = x / c;
   d++;
   i *= ++c;
   j /= i++;
   printf("x = %d c = %d d = %d i = %d j = %d", x, c, d, i, j);

   return 0;
}
```

```
x = 4 c = 4 d = 2 i = 81 j = 0
```

4. The following code computes the prime factorization of a number $a (\geq 2)$ given as input. For example, if $a = 72$, it will print: `Prime factorization = 2 x 2 x 2 x 3 x 3`. Fill up the blanks in this code. **[5]**

```
#include <stdio.h>
int main(){
  int a, d = 2;
  printf("Enter a positive integer: ");
  scanf("%d", &a);
  printf("Prime factorization = ");
  do{
    if (_____________){ // 1.5 marks
      printf("%d x ", d);

      _____________;   // 2 marks
    }
    else
      _____________;   // 1.5 marks
  }
  while(a >= d);
  printf("\b\b \b\b.\n");
  return 0;
}
```

```
a%d==0   a = a/d   d++
```

5. For the C program given below, what will be the output for the input 1234 5678 f (three data items with two spaces in between) are given against a, b, c? **[5]**

```
#include <stdio.h>
int main() {
int a,b;
char c;
printf("Enter the values of a, b, c:");
scanf("%2d%3d%c",&a,&b,&c);
printf("a = %d\n b = %d\n c = %c\n",a,b,c);
scanf("%2d%3d%c%c",&a,&b,&c,&c);
printf("a = %d\n b = %d\n c = %c\n",a,b,c);
return 0;
}
```

Ans:
a = 12
b = 34
c = ' '
a = 56
b = 78
c = f

6. What is the output of the following program? **[2]**

```
#include <stdio.h>
int main() {
double x = 123456789.99;
int y = x;
printf("y = %d\n y = %0.2lf\n", y, (double)y);
return 0;
}
```

Ans:
y = 123456789
y = 123456789.00