Indian Institute of Information Technology
Design and Manufacturing, Kancheepuram
Chennai 600 127, India
An Autonomous Institute under MHRD, Govt of India
An Institute of National Importance
COM - Computational Engineering

End Semester
16-Nov-2017
Duration: 3hrs
Marks: 40

Roll No: Name:

0. Name the scientist who discovered the C programming Language

1 Light Dose

1 mark each

For all questions, write the output. NO justification is needed.

1. Assume user enters 10 20

   ```
   int a,b;
   printf("enter two numbers \n");
   scanf("%d %d", &a, b);
   printf("%d %d",a,b);
   ```

2. Assume user enters 10 20

   ```
   int a,b;
   scanf("%f%f",&a,&b);
   printf("%d%d",a,b);
   ```

3. ```
   int a=5.234, b=0.5;
   printf("%d %d\n",a,b);
   printf("%f %f\n",a,b);
   ```

4. ```
   char a[4]={'1','2','\t','\0'};
   printf("%d %d %d %d\n", a[0],a[1],a[2],a[3]);
   printf("%c %c %c %c", a[0],a[1],a[2],a[3]);
   ```

5. ```
   if(-1)
   printf("IF");
   if(0)
   printf("ELSEIF");
   else
   printf("ELSE");
   ```

6. ```
   int i;
   for(i=1;i<10;i++);
   printf("%d %d %d", i, sizeof(i),sizeof(i=i+5));
   ```

7. ```
   for(float i=0.5; i<5; i+=0.5);
   printf("%f", i);
   ```

8. ```
   int a, *b;
   b=&a;
   printf("%d %d %x %x %p",a,*b, b, &a, &b);
   ```

9.
```
void main()
{
printf("%d \n", 10);
main();
printf("%d \n", -10);
}
```

10.
```
switch(2 < 4 && 5 > 7)
{
default: printf("0");
case 0: printf("1");
case '1': printf("2");
        break;
}
```

2   Medium Dose

1. Consider the data type 'short float' which is 16 bits wide with 1-bit for sign, 4 bits for exponent and 11 bits for mantissa. (i) What is the smallest number represented by this system (ii) largest number represented by the system (iii) represent $-(12.15)_{10}$ using this system.

2. Rewrite the following code using IF-ELSE structure without losing functionality. The output of switch and IF-Else must be same.

```
switch(2 < 4 && 5 > 7)
{
default: printf("0");
case 0: printf("1");
case '1': printf("2");
        break;
}
```

3. The objective of the following code is to check whether a number is divisible by 8. Complete the following code by filling-in the missing code. What is the logic behind this code.

```
int a,b;
scanf("%d", &a);
b=a%1000;
if(  )
printf("divisible by 8");
else
printf("   ");
```

4. What is the output. Justify.

```
int a=2;
printf("%d %d %d %d %d %d %d %d  ",a++, ++a,a=a+2,a=10,a+2,a,a+0,a-1);
```

5. What is the output and the order of evaluation.

```
int a,b,c,d;
a=b=c=d=2;
printf("%d", -a++ + b * c - d > 2 < 50 != 0 && b || c);
```

6. Complete the code, and with justification, write the output.

```
void main()
{
int a=00120;
int b=0x12aA;
printf("the value of a in --- format %d \n", );
printf("the octal value of is   % \n", a );
printf("decimal equivalent of hexa decimal is %d \n",  );
printf("the hexa value of a is % \n", b );

}
```

7. For the numbers $a = 11.27$, $b = 31.5$, perform floating point addition in binary system.

8. For the numbers $a = 57$, $b = 11$, perform $a - b$ in binary system.

9. For the numbers $a = 57$, $b = 11$, perform $a * b$ in binary system.

3   Strong Dose

1. Given two integers a and b, how do you swap the values of a and b using 'Exclusive OR' bit-wise operator. Write the logic and illustrate with an example.

2. Given two strings S_1 and S_2. Write a detailed logic and a C program to check whether S_2 is a substring of S_1. For example: S_1="cater", S_2="cat", is a substring of S_1. If S_2="rat", then it is not a substring of S_1

3. For the following question, mark a 'tick' if the number given can be represented as it is using the data type. Otherwise, mark 'cross'. Justify any two 'tick' and any two 'cross'.

Data Type	120	250	32768	$2^{16} - 10$	$2^{31} + 100$
char					
unsigned char					
short int					
int					
unsigned int					
float					

4. What is the output of the following two programs. Are they equivalent. Justify.

Program 1	Program 2

``
void main()
{
f(0,0);
}
 	
f(int i, int k)
{
printf("%d \n", i);
k++;
if(k <=3)
{
i++;
f(i,k);
printf("the value of i and k %d %d \n",i,k);
printf("%d \n",i+2); }
else
printf("%d \n",i);
}
``
	``
	int i=0,k=0;
	void main()
	{
	printf("%d \n", i);
	k++;
	if(k <=3)
	{
	i++;
	main();
	printf("the value of i and k %d %d \n",i,k);
	printf("%d \n",i+2); }
	else
	printf("%d \n",i);
	}
	``

Extra Credit: (6 marks) (Use additional sheet if required)

(i) Given an integer, say, $a = 1234$, write a program with a detailed logic to list all permutations of the number. I.e., 1243, 3421, 3412, and so on. Write the logic for a 4-digit number and a r-digit number.

(ii) Here is a game between you and the computer. You think of a number and the computer identifies the number without making a mistake by asking a series of questions. For each question asked by the computer, your response is always binary (yes or no). For example: I think of a number, say '18'. System asks; is it a prime, i respond 'no'. System asks is it a even no, i respond 'yes'. On the similar line, system can ask any question and you will always respond in binary. Model this problem using a C program. Write the logic and the program.

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Quiz 1
29-Aug-2017
Duration: 1hr
Marks: 15

Roll No: Name:

1. (1 mark) Map the following. Use lines to map items.

File Type	Encoding
Text	.bmp
Image	.mp4
Audio	ASCII
Video	.wav

2. (2 marks) Draw the model of Human computational system and for each part in the model give one analogous electronic component used in practice.

3. (1 mark) Mention 3 reasons why computers are preferred to humans for computing.

4. (1 mark) Mention two limitations of a scientific calculator.

5. (1 mark) Assuming the unsigned representation, convert the binary number $1\ 0\ 1\ 0\ 1\ 0\ \cdot\ 0\ 1\ 0\ 1$ into a decimal number.

6. (2 marks) Under the signed representation, what is the binary equivalent of (i) 63.415 (ii) -42.71.

7. (2 marks) Convert $(63.415)_{10}$ into an Octal and a Hexa decimal number.

8. (1 mark) Consider the r-digit (r-bit) binary representation. What is the smallest and largest binary number that can be represented in this system. Mention its decimal equivalent.

9. (2 marks) Show that any decimal number maps to a unique binary number.

10. (2 marks) Is it true that decimal number with fractions (example: 63.12) maps to a unique binary number. Justify your answer.

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Quiz 2
05-Oct-2017
Duration: 1hr
Marks: 15

Roll No: Name:

0. (0 marks) Name the first women computer scientist.

1. (3 marks) Mention clearly the error thrown by the compiler on compiling/executing each of the following C statements. Be precise in your answer. Do NOT write 'syntax error'.

   (a) scanf("%d", a);

   (b) int FLOAT, FLOAT;

   (c) int int FLOAT;

   (d) int a; printf("%f", a);

   (e) int number-1;

   (f) int num_ber;

2. (2 marks) With a proper justification, mention what is the output of the following syntactically correct program.

```
int x=2,y=3;
float p=1.2,q=2.1;
printf("%d    %d\n", x,y);
printf("%f    %f\n", p,q);
printf("%f    %f\n", x,y);
```

3. (1.5 marks) Complete the program by filling in the missing details so that program is both syntactically and semantically correct.

```
int flag;
printf("enter flag value\n")
scanf("%d",  flag);
switch(flag)

default: printf("the value of flag is more than 2\n");


case 1: printf("the value of flag is one\n");
printf("i am in CASE 1\n");

case 2: printf( the value of flag is one\n );
printf("i am in CASE 2\n");
}
```

4. (1.5 marks) A user enters an 4-digit integer. Write a C program that will print (i) the first two digits (ii) the last two digits.

5. (2 marks) An identifier has a data type (for example; int a, float b). Do printf and scanf have a data type. If so, what are the data types and what does it refer to.

6. (3 marks) With justification, write the output of the each of the following programs. All three programs are syntactically correct.

(i)
```
    int a;
    if(a = 10)
     printf("i am inside if\n");
    else;
  printf("i am in else\n");
    printf("the value of a is %d",a);
```

(ii)
```
int marks_2=97;
if(marks_2>=90)
printf("grade S\n");
if(marks_2<90 && marks_2>=80)
printf("grade A\n");
if(marks_2<80 && marks_2>=70)
printf("grade C\n");
else
printf("grade D\n");
```

(iii)
```
int a2,a3,a4,a5;
scanf("%d %0d %1d", &a2,&a3,&a4,&a5);
printf("the value of %d %d %d %d",a2,a3,a4,a5);
```

7. (1 mark) What is the output. Justify.

```
for(int r=0; r=3;r++)
printf("the value of r is %d",r);
```

8. (1 mark) Will this program terminate. If so, what is the output. Justify.

```
{
int i=0;
for(i=0;i<20;i++)
{
switch(i)
{
  case 0: i=i+5;
  case 1: i+=2;
  case 5: i+=5;
  default: i=i+4;
                break;
        }
printf("the value of is is %d\n",i);
}
}
```

Indian Institute of Information Technology
Design and Manufacturing, Kancheepuram   End Semester
Chennai 600 127, India   24-Apr-2018
An Autonomous Institute under MHRD, Govt of India   Duration: 3 hrs
An Institute of National Importance   Marks: 40
Computational Engineering

Roll No: Name:

0. Who discovered the C programming language

1   Light Dose

1 mark each

1. What is the output.

```
int a=2.3;
float b=3;
printf("%d %f\n",a,b);
```

2. Display the error message, if error, or display the output.

```
switch(2)
{
case 2: printf("2");
}
```

3. Display the error message, if error.

```
int a=2;
switch(a)
{
case a++: printf("2");
}
```

4. What is the output.

```
if(-1)
printf("-1");
else if(0)
printf("0");
else printf(" 1");
```

5. What is the output. If error, display the error message.

```
if(1);
printf("1");
else
printf("0");
```

6. What is the output. If error, display the error message.

```
for(int j=0; j<10; j >>1);
printf("%d",j);
```

7. Represent $(1234)_{10}$ in base 3 system.

8. Assume 2's complement system, what is the decimal equivalent of 111010.

9. What is the output.

```
int a[3]={1,2,3};
printf("%d %d",sizeof(a), sizeof(a[0]));
```

10. What is the output.

```
int a=31; int* b; b=&a;
printf("%d %x %d %x %x",a, &a,*b, b, &b);
```

11. What operator must be used between 15 and 7 so that the output is 15. Similarly, which operator between 0 and 9 yields 0.

```
printf("%d %d", 15  7, 0  9);
```

12. Write the function prototype for the function `addition()` that takes three variables as arguments, namely `int, float, char`.

13. How do you represent -0 and 255 in a 32-bit floating point format.

14. Display either the output or the error message.

```
int i=0;
switch(i)
{
case 0: i++;
case 1: for(;i<=5;++i);
case 2: printf("%d",i);

}
```

15. Rewrite the following code using IF-GOTO.

```
int i;
for(i=0; i<5; i++);
printf("%d",i);
```

2   Medium Dose

<div align="right">1.5 marks each</div>

1. Perform -4×3 in 2's complement system.

2. Trace the code (write the output of each statement) with respect to $a = 32767, b = 1$. Assume 2's complement system with wrap round for overflow/underflow.

```
short int a,b;
a=a+b;
b=a-b;
a=a-b;
```

3. Perform $100200 - 002101$ in base 3 system. Clearly, mention all intermediate steps when you perform bit-wise subtraction. Do NOT convert this number into any other system to perform this arithmetic.

4. Represent 17.65 in a 32-bit floating point representation.

5. Rewrite using only while statements.

```
if(a>=5)
printf("a >=5");
else if ( a >=3)
printf("a >=3");
else
printf("a is less than 3")
```

6. For the following code; on executing a.out, suppose the user enters the integer 1234 as the first input followed by enter key, how many more inputs the user is expected to enter to complete the task. Justify your answer.

```
int a,b,c,d;

scanf("%1d %1d %1d %2d", &a, &b, &c, &d);

printf("%d %d %d %d \n",a,b,c,d);
```

7. What is the output. Justify.

```
void main()
{
function(0);
}

function(int a)
{
if(a==3)
return;

a++;
function(a);
printf("%d  ",a);
}
```

8. Rewrite using IF-ELSE.

```
int c;
switch(c)
{
 default: printf("default");
 case 1:
 case 2:
 case 3: printf("3"); break;
 case 4: printf("4"); break;

}
```

9. Justify the output of the code.

```
printf("%d",printf("hello")+printf("world"));
```

```
int a,b,c;
```

```
printf("\n%d",scanf("%d %d",&a,&b)+scanf("%d",&c));
```

10. How do you compute the length of a string (char array) using just one printf statement. Note: if you use printf inside printf, then it is treated two printf statements.

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Quiz 1
Duration: 1hr
Marks: 15

Roll No: Name:

1. (1.5 marks) Match the following

Sampling	text
Pixel	Mp4
ASCII	Mp3
Frames	jpeg

2. (2 marks) Draw the Human computational model. For each biological part of the body, mention one analogous electronic component.

3. (2 marks) Represent the decimal numbers (i) 129 (ii) -63 in base 4 system.

4. (2 marks) Represent the decimal numbers (i) 12.75 (ii) 12.74 (iii) -12.74 (iv) 0.0 in binary. Assume 3 bit approximation to represent fractions.

5. (1+2=3 marks) Perform: $(128)_{10} - (1)_{10} - (17)_8 - (2E)_{16}$. Clearly mention intermediate steps.

6. (2 marks) Multiply: $(222)_3$ with $(222)_3$. Clearly mention intermediate steps.

7. (2.5 marks) Given a decimal number x, how many bits are required to represent x in binary. For example, the binary equivalent of 4 is 100 which requires 3 bits. Justify your answer. How many bits are required if x is a negative number.

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Quiz 2
Duration: 1hr
Marks: 15

Roll No: Name:

0. (0 marks) Who is the first women computer scientist

1. (2 marks) What is the range of integers that can be represented in a 5-bit signed magnitude binary system. In this system, perform (i) 13+7 (ii) -13-4

2. (2 marks) Represent (i) 127.175 in a 32-bit floating point format (ii) 32 in 2's complement system (iii) -32 in 2's complement system

3. (1.5 marks) What is the output. Justify.

```
int a=1,b=2,c,d;
float x=5.0,y=6.0,w,z;
printf("%d %d \n", a,b);
printf("%f %f \n", x,y);
printf("%d %d \n", w,z);
printf("%f %f \n", c,d);
```

4. (1.5 marks) Rewrite the following using IF-ELSE structure without compromising on the underlying logic.

```
int a;
switch(a+2)
{
case 49: { printf("the value of this case is %d", 49);
            break;
        }
case 48: printf("the value of this case is %d \n", 48);
        printf("case without break st");
default: printf("i am in default case");
}
```

5. (1.5 marks) Identify all errors in this code.

```
int a=1;
switch(a)
{
case 1: printf("case label is 1");

case 0: printf("case label is 0");

case a>5: printf("case with comparison operator");

case (7||1): printf("case with logical operator");

case (2==5): printf("case with equality operator");

case printf("ab"): printf("case with printf");

}
```

2

6. (1.5 marks) The following code extracts the first three digits and the last three digits of an integer variable p. Complete the code. Do NOT add additional instructions.

```
printf("the first 3 digits=      , the last 3 digits=      ,"      ,      )
```

7. (1.5 marks) A user enters an integer. Can we get the number of digits entered using just printf/scanf statements. If so, write the code using printf/scanf statements. You should not use selection/repetition statements. If not possible, give a justification.

8. (1 mark) What is the output. Justify.

```
if(a==5);
{
printf("the value of a is %d", 5);
printf("inside if");
}
else;
```

9. (1 mark) What is the output. Justify.

```
printf("output");
printf("\b\b");
printf("erform");
printf("\r\trmer");
```

10. (1.5 marks) Complete the code.

```
float a=127.127
printf("the value of a in 6.5 format is        ",a);

printf("the integer part of a is            ",     );

printf("the value of a in 18.5 format prefixed with zeros is        ",     );
```

3

Extra Credit (3 marks): Consider the base r system. (i) What is the range of numbers in decimal represented by this system in (a) signed system (b) 1's complement system (c) 2's complement system. (ii) Given an integer n, how many bits do you need to represent n in all of the above three systems. Express as a function of n and r.

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Quiz 2
Duration: 1hr
Marks: 15

Roll No: Name:

0. (0 marks) Who is the first women computer scientist: Ada Lovelace

1. (2 marks) What is the range of integers that can be represented in a 5-bit signed magnitude binary system. In this system, perform (i) 13+7 (ii) -13-4
   Soln: Range: -16 to 15. 13+7 = 01101 + 00111 = 10100, -13-4 = 11101 + 10100 = 10001

2. (2 marks) Represent (i) 127.175 in a 32-bit floating point format (ii) 32 in 2's complement system (iii) -32 in 2's complement system
   Soln: (i) Sign bits: 0, Exponent: 0000110 , Mantissa: 11111100101100110011001

   32= 0100000 (7 bits) , for positive numbers, no need to compute 2's complement OR 2's complement of a positive number is just its binary repn.

   -32: 1's compl of (0100000)=(1011111), 2's compl (1011111)=1100000

3. (1.5 marks) What is the output. Justify.

```
int a=1,b=2,c,d;
float x=5.0,y=6.0,w,z;
printf("%d %d \n", a,b);  // output: 1   2
printf("%f %f \n", x,y);  // output: 5.000000  6.000000
printf("%d %d \n", w,z);  // output: either junk or some content from integer pipe
printf("%f %f \n", c,d);  // output: either junk or some content from float pipe
```

4. (1.5 marks) Rewrite the following using IF-ELSE structure without compromising on the underlying logic.

```
int a;
switch(a+2)
{
case 49: { printf("the value of this case is %d", 49);
           break;
         }
case 48: printf("the value of this case is %d \n", 48);
         printf("case without break st");
default: printf("i am in default case");
}

if(a+2==49)
{ printf("the value of this case is %d", 49);
```

```
            break;
          }
   else if(a+2==48)
   {       printf("the value of this case is %d \n", 48);
             printf("case without break st");
      printf("i am in default case");
   }
   else
   printf("i am in default case");
```

5. (1.5 marks) Identify all errors in this code.

```
int a=1;
switch(a)
{
case 1: printf("case label is 1");

case 0: printf("case label is 0");

case a>5: printf("case with comparison operator");   // Error: integer constant expected,
//variable cannot be used

case (7||1): printf("case with logical operator"); // case 1, duplicate case label

case (2==5): printf("case with equality operator"); // case 0, duplicate case label

case printf("ab"): printf("case with printf"); // Error: integer constant expected

}
```

6. (1.5 marks) The following code extracts the first three digits and the last three digits of an integer
   variable p. Complete the code. Do NOT add additional instructions.
   printf("the first 3 digits=   , the last 3 digits=   ,"   ,   )

   Assuming: 6 digits, then

   printf(the first 3 digits=%d, the last 3 digits=%d,",p/1000,p%1000) }

   In general,

   printf(the first 3 digits=%d, the last 3 digits=%d,", p/(pow(10,log(10,p)-3)), p%1000) }

7. (1.5 marks) A user enters an integer. Can we get the number of digits entered using just printf/scanf
   statements. If so, write the code using printf/scanf statements. You should not use selection/repetition
   statements. If not possible, give a justification.

```
printf("enter an integer");
scanf("%d",&a);
printf("%d%n",a,&num);
printf("%d",num); // num stores the no of digits in a

printf("enter an integer");
scanf("%d",&a);
printf("no of digits=%d",printf("%d",a));
```

8. (1 mark) What is the output. Justify.

```
if(a==5);
{
printf("the value of a is %d", 5);
printf("inside if");
}
else;   // ERROR: else with no if statement, NOTE: there is a semicolon after the previous if
```

9. (1 mark) What is the output. Justify.

```
printf("output");
printf("\b\b");   // cursor is at 'u'
printf("erform"); // outperform
printf("\r\trmer"); // cursor moves to the front and jumps to 9th place (tab offers 8 white spaces)
 prints outperformer
```

10. (1.5 marks) Complete the code.

```
float a=127.127
printf("the value of a in 6.5 format is  %6.5f       ",a);

printf("the integer part of a is      %3.0f     ",   a   );

printf("the value of a in 18.5 format prefixed with zeros is %018.5       ",    a );
```

Extra Credit (3 marks): Consider the base r system. (i) What is the range of numbers in decimal represented by this system in (a) signed system (b) 1's complement system (c) 2's complement system. (ii) Given an integer n, how many bits do you need to represent n in all of the above three systems. Express as a function of n and r.

Hint: 1 How do you define 1's complement and 2's complement in base r system. As such it is defined only for binary system.

Hint: 2 Try using logarithmic functions (with floor/ceil) to express the number of bits. Check are you getting $\log_r(n) + 1$ or $\log_r(n) + 2$ with appropriate ceil/floor functions.

Computational Engineering - Practice Session
Linux Commands

1. Open a terminal and create a linuxcommands.txt in the current directory. Whatever commands you type on the prompt must be recorded in this text file for your reference and will be of use to you during examinations.

2. Check the path of the current directory and create a folder named `LinuxPractice` in the current directory.

3. Create three sub folders (sub directories) namely, DOC, PPT and TXT in LinuxPractice. Verify whether it is created.

4. Create sample files 1.doc, 2.doc, 3.doc, 1.ppt, 2.ppt, 3.ppt, 1.txt, 2.txt, 3.txt in the respective sub folders. Verify whether it is placed in respective directories.

5. Copy all the contents of DOC, PPT and TXT to LinuxPractice. Verify.

6. Do the above task in a single command. Verify.

7. Create a folder LinuxPracticeCopy in the current directory. Move 3.doc, 3.ppt, 3.txt from the parent directory to this directory.

8. Remove all ppt files present in LinuxPractice in a single command.

9. Goto LinuxPracticeCopy directory and remove all files present in it in a single command.

10. Delete LinuxPracticeCopy temporarily. Restore the deleted folder through prompt.

11. Goto LinuxPractice and list all files with the extension .ppt

12. Goto LinuxPractice and list all files that begin with '2'

13. Identify the path of 3.txt, 3.ppt

14. Open 3.ppt using a terminal. Once it opens, search for the pattern 'iiitdm'. After the search, close the file using the terminal.

15. Copy the last two commands typed at the terminal to linuxcommands.txt. This must be done using mouse and key board.

16. Open 3.txt at the background so that other operations can be performed through the terminal.

17. Copy LinuxPractice to Documents folder. After copy, compress the folder in Documents.

18. Goto LinuxPractice; combine 1.txt, 2.txt, 3.txt into a single text file named SingleTextFile.txt.

19. Open 1.doc, 2.doc and export it as pdf document. Merge 1.pdf and 2.pdf using a terminal.

20. Delete 1.doc, 2.doc permanently. Verify whether it is permanent delete.

Note:
1. At the end of this exercise, email linuxcommands.txt to your personal email for future reference.
2. Explore more about linux commands and their options through online resources.

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End Sem
27-Nov-2018
Duration: 3hr
Marks: 40 marks

Roll No: Name:

1. (3 marks) Mention a file format (extension) for each of the following application.

    (a) To store a document

    (b) To store an image

    (c) To store an audio

    (d) To store a video

    (e) To store a C Program

    (f) To store a binary file of a C program

2. (3 marks) Represent the integer 65 in (i) Binary (ii) Base 3 system (iii) Octal system

3. (2 marks) Represent the real number 31.125 in binary system.

4. (3 marks) Multiply: $(101010)_2 \times (0101)_2$. Clearly mention all intermediate steps.

5. (2 marks) Perform: $(11111)_2 + (111)_2$. Clearly mention all intermediate steps.

6. (2 marks) Perform: $(1010000)_2 - (001)_2$. Clearly mention all intermediate steps.

7. (5 marks) Write the output for each of the following;

(a)
```
void main()
{
int a=2, b=1;
printf("%d %d",a,b);
printf("%f %f",a,b);
}
```

(b)
```
void main()
{
    float a=2, b=1;
    printf("%d %d",a,b);
    printf("%f %f",a,b);
}
```

(c)
```
void main()
{
    for(int i=0; i<=5; i++);
    printf("%d",i);

}
```

(d)
```
void main()
{

    if(-5)
    printf("negative");
    else
    printf("positive");
    if(0)
    printf("zero");
}
```

(e)
```
void main()
{
    int i=0;
    while(i<=1)
    {
    printf("%d",1);
    }
}
```

8. (1.5 marks) The following program accepts two integers, a and b, and the $GCD(a, b)$. Compute the $LCM(a, b)$ using just one printf statement.

```
void main()
{
int a,b,GCD;
printf("enter two integers");
scanf("%d %d",&a,&b);
printf("enter GCD of a and b");
scanf("%d",&GCD);
printf("LCM of a and b is %d",                    );
}
```

9. (1.5 marks) Rewrite the following code using WHILE loop. Your code should not use IF-ELSE. If it cannot be written, justify your answer.

```
void main()
{
int a;
scanf("%d",&a);
if(a>=50)
printf("inside IF - %d",a);
```

3

```
else
printf("inside ELSE - %d",a);
}
```

10. (1.5 marks) Rewrite the following code using FOR loop. Your code should not use IF-ELSE. If it cannot be written, justify your answer.

```
void main()
{
int a;
scanf("%d",&a);
if(a>=50)
printf("inside IF - %d",a);
else
printf("inside ELSE - %d",a);
}
```

11. (2 marks) Represent the following float numbers (i) -127.625 (ii) 255, in 32-bit format.

12. (2 marks) What is the smallest and the largest number that can be represented in 32-bit float format.

13. (1.5 marks) Rewrite the following code using Switch-Case. Your code should not use IF-ELSE. If it cannot be written, justify your answer.

```
void main()
{
int a=50;
l:
if(a>40)
{
   int a;
   scanf("%d",&a);
   printf("the value of a is %d",a);
if(a==3)
goto l;
}
}
```

14. (2 marks) What is the order of the evaluation. Clearly mention the order and the output of each stage.

```
5 + 3 >> 2 < 0 << 14 - 6 * 2 && 4 * 3 + 3 & 11
```

15. (2 marks) Mention all intermediate steps and the output of the following code.

```
int x;
printf("%d %d %d %d %d %d", x=x+2, x>>2, x++, x=x*2, x!=0, x=21<<1*2);
```

16. (2 marks) Perform $-6 * 12$ in 2's complement system.

17. (2 marks) Consider a 4-bit 2's complement binary system. What is the range of numbers represented by this system. What is the result of the following arithmetic (i) -7-3 (ii) 7+3

18. (2 marks) What is the value of c, d, and e. Justify.

```
int j,c=1,d=1,e=1;

for(int i=1; i<=256; i=i*2)
{ j=1, d=1, e++ ;
while(j<=256)
{ j=j*3;
  c++, d++;
}
}
printf("%d %d %d",c,d,e);
```

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Quiz 1
28-Aug-2018
Duration: 1hr
Marks: 15

Roll No: Name:

1. (2 marks) Map the following. Use lines to map items.
File Type	Encoding
Text	.jpeg
Image	.mp4
Audio	ASCII
Video	.mp3

2. (2 marks) Draw the model of Human computational system and for each part in the model give one analogous electronic component used in practice.

3. (2 marks) Convert the decimal number $(111)_{10}$ into a binary number and octal number.

4. (2 marks) Under the signed representation, what is the binary equivalent of (i) 63.415 (ii) -42.71.

5. (1 mark) Assuming the unsigned representation, convert the binary number $1\ 0\ 1\ 0\ 1\ 0 \cdot 0\ 1\ 0\ 1$ into a decimal number.

6. (3 marks) Perform $(77)_{10} - (22)_{10}$ using base 2 system and base 3 system. Clearly mention all intermediate steps.

7. (3 marks) Perform $(77)_{10} * (22)_{10}$ using base 2 system and base 3 system. Clearly mention all intermediate steps.

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Quiz 2
04-Oct-2018
Duration: 1hr
Marks: 15

Roll No: Name:

1. (1.5 marks) What is the output of the following code. Justify your answer.

```
int a,b;
float x=1.1;
float y=2.1;
printf("\n the value of x=%f y =%f", x,y);
printf("\n the value of a=%f b =%f", a,b);
```

2. (2 marks) What is the output of the following code. Justify your answer.

```
float x=1.1;
float y=2.1;
printf("\n\n%10.6f\n",x);
printf("\n\n%010.6f\n",x);
printf("\n\n10.6%f\n",x);
printf("\n\n010.6%f\n",x);
```

3. (2 marks) The following code (incomplete code) extracts individual digits from a 4-digit number x.
   Fill-in the missing details to complete the code.

```
int x=1234;

int x1=x/     ;

int x2= ( x- x1*1000 )/100;

int x3=( x - x1*      - x2*100 ) / 10 ;

int x4= (x - x1*1000 - x2*     - x3*     ) /1 ;

printf("\n \n the output of logic is %d \n  %d \n %d \n %d \n\n", x1,x2,x3,x4);
```

4. (2 marks) Given a 4-digit number x, use exactly one printf statement to extract the individual digits. No additional statement is allowed and all arithmetic must be done in a single printf statement. If not possible, justify your answer.

5. (1.5 marks) With proper justification, write the output of the following code.

```
float x=1.1;
printf("%d\n",printf("\n\n%10.6f\n",x));
```

6. (1.5 marks) Will the following code work fine. If it works fine, what is the output. If error, mention all errors thrown by the compiler.

```
int a,b,z=scanf("%d%d",&a,&b);

switch(z)
{

case 2: printf("Case 2"); printf("Strange question");

case 1: printf("Case 1"); printf("Strange question");

}
```

7. (2 marks) Rewrite the following code using Switch statement.

```
int m;

if(m<0) printf("m is -ve\n");
```

```
else if(m >0) printf("m is +ve\n");

else printf("m equals 0");
```

8. (1 mark) Mention all errors thrown by the compiler.

```
int m;

if(m<0); printf("m is -ve\n");

else if(m >0); printf("m is +ve\n");

else printf("m equals 0");
```

9. (1.5 marks) Mention all errors thrown by the compiler.

```
int a,b,z=scanf("%d%d",&a,&b);

switch(z)
{

case 2: printf("Case 2"); printf("Strange question");

case 1: printf("Case 1"); printf("Strange question");

case 2-1: printf("2-1");

case z+2: printf("z+2");

}
```

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COM 501 Advanced Data Structures and Algorithms

End Semester
25-Apr-2019
Duration: 3 hrs
Marks: 50

Roll No: Name:

0. Name the first women computer scientist

1 Light Dose

1. Mention the precise error message in each of the following.

   (a) (3 marks)

   ```
   void main()
   {
   FLOAT x, y;
   int a=3;
   }
   ```

   (b)
   ```
   void main()
   {
   int a[];
   a[]={0};
   }
   ```

   (c)
   ```
   void main()
   {
   int a=5;
   5++;
   }
   ```

   (d)
   ```
   void main()
   {
   int *a;
   *(a*4)=20;
   }
   ```

   (e)
   ```
   void main()
   {
   int c[30]={0};
   switch(b)
   {
   case '1+2*4': printf("something");

   case c[20]: printf("something");
   }  }
   ```

   (f)
   ```
   void main()
   {
   for(int k=9; k>0; k--);
   printf("%f",k);
   }
   ```

2. (2 marks) What is the output?

```
void main()
{
char c[]="design and\0 manufacturing\0";
char d[]={'1','2','\0','\n'};

printf("%s  %s\n",c, d);
printf("%c %c %d %d",d[0],d[1],d[2],d[3]);
}
```

3. (1 mark) What is the output?

```
int counter=0;
for ( ; ;)
{
if (counter==5) break;
else
{
counter++;
continue;
}
}
printf("%d",counter);
```

4. (2 marks). Clearly mention the order of execution of the following expression.

```
5 << 2 + 1 * 0 && 15 > 12 % 5 & 7 ^ 3
```

5. (2 marks) The following code computes the sum of the digits of an integer. Complete the code.

```
int num, sum=0;

while(num >0)
{

sum=          + num          ;

num=               ;

}
printf("%d", sum);
```

6. (2 marks) What is the value of count in the following code. Justify.

```
int count=0;
for(int i=0 ; i < 100 ; i=i+2)
for(int j=0 ; j < 100 ; j=j+3)
{ printf("%d %d", i, j);
   count++;

}
printf("%d",count);
```

2   Medium Dose

1. Perform $(2222)_3 \times (2020112)_3$ in base 3 system. Conversion to other base systems is not permitted.

2. Represent (i) -7.75 (ii) 123.128 in IEEE format.

3. Is the output of 'if' and 'switch' same. If not, modify the switch block so that their outputs are same. Justify your answer.

```
float cgpa;

if(cgpa>=9) printf("honors");
else if(cgpa>=8.5) printf("distinction");
else printf("btech");

int b=(cgpa>=9) + !(cgpa>=9)+(cgpa>=8.5) + !(cgpa>=9) + !(cgpa>=8.5)+(cgpa<8.5);

switch(b)
{
case 1: printf("honors"); break;
case 2: printf("distinction"); break;
case 3: printf("btech"); break;
}
```

4. Write a C program that takes an integer array A of size n and sort A as follows; the first $\frac{n}{2}$ elements are in increasing order and the rest are in decreasing order.

5. Consider the recursive code of Fibonacci series. Draw the recursion tree for $n = 4$ assuming the base values are $n = 0$ and $n = 1$. Also, count the number of additions.

6. Write the recursive code for $a + b$. Your code must be complete in all aspects.

7. What is the output. Justify.

```
int x, *p;
// Assume the address of x is 1234 and p is 5678, p+1 is 5682, p+2 is 5686
x=20;    p=&x;   *p=200;
printf("%d  %d  %p  %p %p \n", x, *p, &x, p, &p);


printf(" %p %d   %d   %d   %d", p, *p++, (*p)++, *(p++), x++);
```

3   Strong Dose

<div align="right">3 marks each</div>

1. What is the output. Justify.

```
void main()
{
int a=1234;

printf("%d %d %d %d %d", printf(" %d ",a), a/10, (a/100)%10, (a/1000)%100, a%1000);

}
```

2. Assuming 32-bit IEEE floating point representation, count the number of floating point numbers between integers 1 and 3. Justify your count.

3. Accept two integers n and r from the user. Write a recursive code to compute $\frac{n!}{r!(n-r)!}$. Your code must be complete in all aspects.

4. Is the output of 'switch block' given below same as the output of 'if block'. Justify your answer. If the outputs are different, modify the code so that the output is as expected.

```
int marks=70;
switch(marks<0 || marks >100)
{
case  0:{ if(80 <= marks <= 100) printf("grade S");
          if (60 <= marks <80) printf("grade A");
          else printf("grade B"); break;}
}
marks=70;
if(marks>=0 && marks <=100)
{
 if(80 <= marks <= 100)  printf("grade S");
 else if (60 <= marks <80)  printf("grade A");
 else printf("grade B");
}
```

5. Consider the Base 12 System. Perform (i) 8888 + 9999 (ii) 9812 - 8888. Clearly mention addition and subtraction rules used.

6. What is the output. Justify.

```
int i=0;
for(i=0;i<20;i++)
{
switch(i)
{
  case 0: i=i+5;
  case 1: i=i+2;
  case 5: i=i+5;
  default: i=i+4;
                    break;
          }
printf("the value of i is %d\n",i);
}
```

7. What is the output. Justify for each printf statement.

```
printf("%d  %d \n", 00123, 0X123);
```

```
printf("%c  %c", '123', '\0');
```

```
printf("\n %10.2f   %-8.1f  %+6.1f  %4.0f", 2.001, 2.001, 2.001, 2.001);
```

8. Write a C program that will print all possible integer solutions (integral solutions) to the equation $x_1 + x_2 + x_3 + x_4 = 20$, $x_1, x_2 \geq 0$ and $x_3, x_4 \geq 1$.

Extra Credits: Box-Coin problems. Recall two questions asked in class. Present your solutions.

C Practice - End Sem - April, 11

Instructions: 0. Stay cool to exhibit a good performance. Think logically to give your best.
1. Code Reusability, usage of Internet, Peer discussion (between 13.00 - 14.00) are strongly encouraged. No peer discussion after 14.00.
2. Get your code evaluated by TAs. Also, submit the code by email.

1. Given a 3-length string (ex: 'abc', '123','s@5'), print all its permutations.
   (1 mark) - Declaration
   (2 marks) - input acceptance
   (2 marks) - printing permutations. You get 1 mark if it is partially correct.

2. Given an integer array A of size n, present four different logic to find MAX and MIN in A. Use four different functions to implement four different logic plus main().

   - (1.5 marks) Informal Explanation (in English) of Logic 1 (Do not write C code)

   - (1.5 marks) Informal Explanation (in English) of Logic 2 (Do not write C code)

   - (1.5 marks) Informal Explanation (in English) of Logic 3 (Do not write C code)

   - (1.5 marks) Informal Explanation (in English) of Logic 4 (Do not write C code)

   (1 mark) - Variable and Array declaration
   (1 mark) - Usage of functions
   (3+3+3+3=12 marks) - Implementation of Logic. Partial marks will be given wherever necessary.

3. Given two strings S_1 and S_2. Print $S_1 \times S_2 = \{(x, y) \mid x$ is a character in S_1, y is a character in S_2 }. (cross product). For example $S_1 = "ab"$, $S_2 = "3c"$, then $S_1 \times S_2 = \{(a, 3), (a, c), (b, 3), (b, c)\}$.
   (1 mark) - Variable and Array declaration
   (2 marks) - input acceptance
   (7 marks) - printing the cross product. Partial marks in the range 2 to 5 will be given wherever necessary.

1

C Practice - End Sem - April, 11

Instructions: 0. Stay cool to exhibit a good performance. Think logically to give your best.
1. Code Reusability, usage of Internet, Peer discussion (between 13.00 - 14.00) are strongly encouraged. No peer discussion after 14.00.
2. Get your code evaluated by TAs. Also, submit the code by email.

1. Given an integer array A of size n, count in A, the number of numbers that are (i) positive (ii) equals zero (iii) negative. For example; $A = \{-1, 0, 0, 3, 400, -5\}$, the count of positve, equals zero and negative is 2 each.
   (1 mark) - Declaration
   (1 mark) - input acceptance
   (1+1+1 marks) - printing count. You get 1.5 marks if it is partially correct.

2. Given an integer array A of size n, present four different logic to find MAX and SECOND MAX in A. Use four different functions to implement four different logic plus main().

   - (1.5 marks) Informal Explanation (in English) of Logic 1 (Do not write C code)

   - (1.5 marks) Informal Explanation (in English) of Logic 2 (Do not write C code)

   - (1.5 marks) Informal Explanation (in English) of Logic 3 (Do not write C code)

   - (1.5 marks) Informal Explanation (in English) of Logic 4 (Do not write C code)

   (1 mark) - Variable and Array declaration
   (1 mark) - Usage of functions
   (3+3+3+3=12 marks) - Implementation of Logic. Partial marks will be given wherever necessary.

3. Given two strings S_1 and S_2. Print $S_1 \text{xor} S_2 = \{x \mid x$ is a character in S_1 or S_2 but not both $\}$. For example $S_1 = "ab"$, $S_2 = "3c"$, then $S_1 \text{xor} S_2 = \{a, b, 3, c\}$. $S_1 = "ab", S_2 = "b3"$, then $S_1 \text{xor} S_2 = \{a, 3\}$
   (1 mark) - Variable and Array declaration
   (2 marks) - input acceptance
   (7 marks) - printing the xor. Partial marks in the range 2 to 5 will be given wherever necessary.

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Quiz 1
Duration: 1hr
Marks: 15

Roll No: Name:

0. (0 marks) Expand wifi.

1. (1 mark) Match the following

File Type	Encoding
Text	.mp4
Image	.mp3
Audio	.xls
Video	.pdf

2. (1 mark) Find the binary equivalent of (i) 127 (ii) 127.615 (use 4 bits after the decimal point)

3. (1.5 marks) The number of bits required to represent 64 and -64 in binary system under (i) Signed representation (ii) 1's complement (iii) 2's complement

4. (2 marks) Perform $(22222)_3 \times (22222)_3$ in base 3 system. All intermediate steps must be in base 3 and no conversion to any other system is allowed. Clearly, mention intermediate steps.

5. (3 marks) Mention the precise error message displayed by the complier while we run the following
   programs on a system.

   - ```
     for(int i=0; i<=5; i = i*2);
     printf("%d",i);
     ```
   - ```
     if(1);
     else printf("%d",5);
     ```
   - ```
     int a;
     scanf("%d",a);
     ```
   - ```
     switch(a)
     {
     case 1:
     case 6-5:
     case 0:
     }
     ```
   - ```
     printf("%d",c);
     ```
   - ```
     Int a,b,c;
     INT x;
     ```

6. (1+0.5+0.5=2 marks) The following C program prints the length, the first 3 digits and the last 3
   digits of an integer (at least 6 digits). Complete the code by filling-in the missing details in the printf
   statement. Do not add any other statement.

   ```
   void main()
   {
   int a;
   scanf("%d",&a);
   printf("\n\n Length=%d First3=%d Last3=%d",                  ,              ,                   );
   }
   ```

7. (1.5 marks) Write a C program that accepts an integer and print the same along with sign. For
   example, 5 and −5 must be printed as +5 and −5. For −0 and +0, the output is 0.

8. (1.5 marks) Rewrite the following code using switch-case.

```
if(marks >=85 && marks <=100)  printf("grade S");
else if(marks >=70 && marks <85) printf("grade A");
else printf("grade B");
```

9. (1 mark) What is the output. Justify.

```
for(int i=1; i<=15; i=i^2)
{
printf("\n%d",i);
}
```

10. (1 mark) Fill-in the missing details. What does the following program do?

```
int a;
scanf("%d",&a);

if(        == 1 )

printf("number is        ");
else
printf("number is odd ");
```

3

Extra Credit: (2 marks) Recall decimal to binary conversion procedure (repeated division). Show that any decimal number maps to a unique binary number.

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Quiz 2
14-Mar-2019
Duration: 1hr
Marks: 15

Roll No: Name:

0. (0 marks) Who discovered the C programming.

1. (6*0.25=1.5 marks) Present the output.

   ```
   int a=1,b=2,c=3,d=4;

   printf("%d  %d  %d  %d  %d  %d",a+b*c-d, ++b, d<<1, !c, d==4, a^1);
   ```

2. (2 marks) Clearly mention the order of execution and the output of each step of the following expression.

   ```
   printf("%d",1 + 2 * 10 % 3 << 3 & 8 * 1 && 5 << 1 == 0 > -5);
   ```

3. (1.5 marks) With clear justification, present the output.

   ```
   printf("%d %d", 6<<-2, 8>>-3);
   ```

4. (1.5 marks) What is the output of the following code. Justify.

```
int a=2, b=3;
a=a+b-(b=a);
printf("%d%d",a,b);
```

5. (1 mark) What does the following program do? Justify.

```
int x[500], count=0;

for(int i=0;i<499;i++)

if(x[i]<=x[i+1]) count++;

if(count==499) printf("something");
```

6. (1.5 marks) Rewrite the following code using while loop (without using if-else/switch).

```
int y;

if(y>5)
printf("y is greater than 5");
else if (y < 5)
printf("y is less than 5");
else
printf("y is 5");
```

7. (2.5 marks) The following program counts the numbers of odd (even) numbers in the array z. Fill-in the missing details.

```
int z[50], j=     , Count_O=     , Count_E=0;

while( j <=        )
{

while ( z[   ]    &     )
{
 ++Count_O; goto w;
}

w:

j=       ;

}

printf("\n %d  %d", Count_O, Count_E=50-Count_O);
```

8. (0.5+1+1+1=3.5 marks) Represent the following numbers in floating point representation format. (i) 255 (ii) -12.125 (iii) 0.01 (iv) 0.5. Calculate at least 4 bits in the mantissa.