PROGRAMMING FOR PROBLEM SOLVING
(CSEN 1001)

Time Allotted : 3 hrs. **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) The expression 4 + 6 / 3 * 2 – 2 + 7 % 3 evaluates to
(a) 7 (b) 6 (c) 4 (d) 3.

(ii) Consider the following macro definition with arguments:
#define CUBE(x) (x*x*x)
Which of the following would be the correct expansion of the following statement written in C?
volume = CUBE(a+b);
(a) volume = (a+b * a+b * a+b); (b) volume = ((a+b) * (a+b) * (a+b));
(c) both (a) and (b) (d) None of these.

(iii) Suppose both p1 and p2 are pointers to the same array. Now which of the following operations on the pointers are not allowed in C language?
(a) p1 + p2 (b) p1 - p2 (c) p1+1 (d) p2++

(iv) Bootstrap program is stored in
(a) PROM (b) EEPROM (c) RAM (d) None of these

(v) Consider the following C statement, where a & b are two integer variables:
scanf("%d %*d %d", &a, &b);
If the input data is: 123 456 739, then which of the following value will be assigned to the variable b?
(a) 123 (b) 456 (c) 739 (d) garbage value.

(vi) When printf() fails, it returns
(a) 0 (b) Negative number (c) NULL (d) None of these

(vii) Consider the following two statements written in C language:
FILE * fp;
fp = fopen("TEST.TXT", "r+");

Which of the following operations can be performed on the file named as "TEST.TXT"?
(a) only reading (b) only writing
(c) both reading and writing (d) appending.

(viii) Which of the following is the 2's complement representation of -4?
(a) 1011 (b) 0100 (c) 1101 (d) 1100

(ix) Packed BCD representation of the decimal number 123 is
(a) 0000 0001 0010 0011 (b) 0001 0010 0011 0000
(c) 0000 0001 0000 0010 0000 0011 (d) None of these.

(x) In which part of a C program compilation process, file inclusion is dealt with?
(a) Assembling (b) Linking (c) Loading (d) Pre-processing

Group – B

2. (a) "Storing negative numbers using 1's complement or 2's complement representation rather than signed magnitude representation leads to substantial saving in circuitry" – Is the above statement TRUE or FALSE? Give reasons against your answer.

(b) Find the sum of the following binary numbers represented in a 5-bit sign-magnitude register and that uses 1's complement to represent negative numbers:
(i) -0110 and -0111
(ii) + 0011 and - 1101

(c) Draw a flowchart to print the sum of the digits of a number given by the user.

(1 + 2) + (2 + 2) + 5 = 12

3. (a) Convert the following:
(i) $25.625_{10} = (?)_2$
(ii) $362.35_8 = (?)_{10}$
(iii) $42A.12_{16} = (?)_{10}$

(b) Consider the decimal number +2.7. Convert this number to its equivalent IEEE754 32-bit floating point representation.

(c) Consider the following IEEE754 32-bit pattern:
1 10000001 01000…00
What is the decimal value that the above pattern represents?

(2 + 2 + 2) + 3 + 3 = 12

Group – C

4. (a) Consider the following code snippets written in C along with their outputs. Give the reasons in detail behind the results for each of the following cases.
i)
int main ()

```
{
    int a = 1, b = 2, c = 3;
    printf ("%d \n", a += (a += 3, 5, a));
    return 0;
}
```

The above code returns the output 8.

ii)

```
int main ()
{
     int m=1, n=1, r=1, s=3, t=5, x;
     x=++m && n++ && --r && s/2 && ++t;
     printf ("\n m=%d, n=%d, r=%d, s=%d, t=%d, x=%d", m, n, r, s, t, x);
     return 0;
}
```

The output of the above code is:
m=2, n=2, r=0, s=3, t=5, x=0

iii)

```
int main ()
{
    int i =1024;
    for (; i; i>>=1)
         printf ("Hello world\n");
    return 0;
}
```

The above program prints "Hello World" 11 times.

(b) Write a C program to find which of the numbers is odd and which of the numbers is even from a set of numbers given by the user using bitwise AND operator.
Note that you don't know in advance how many numbers are there and that's why you are not allowed to use array.

(3 + 2 + 2) + 5 = 12

5. (a) Consider the weekly salary of a salesperson who is selling some domestic products. If x is the number of products sold in a week, then the weekly salary is given by the following rules:

$$\text{Salary} = \begin{cases} 4x + 100 & \text{for } x < 40 \\ 300 & \text{for } x = 40 \\ 4.5x + 150 & \text{for } x > 40 \end{cases}$$

(i) Write the **if…else** statements in C language to represent the above rules
Replace the **if…else** statements written in part (i) above with its equivalent expression using conditional operator.

(b) Suppose you want to write a 'if' statement in a C program as follows, where 'payCode' is an integer variable:

```
if (payCode = = 4)
```

```
        printf ("\n You get a bonus");
```

But by mistake the 'if' statement is written as follows:

```
    if (payCode = 4)
      printf ("\n You get a bonus");
```

Do you get the same result for this mistake? Give reasons against your answer.

(c) Write a C program to print the following pattern where the number of rows in the pattern is a user input.

```
* * * *
* * *
* *
*
* *
* * *
* * * *
```

(2 + 2) + (1 + 2) + 5 = 12

Group – D

6. (a) What do you mean by storage class of a variable in C language? What is the default storage class of C variables? What is the scope and longevity of static variables?

(b) How can you allocate a 2-D integer array with 2 rows and 3 columns dynamically in C? Show the steps using an example

(c) Write a C program to insert an element (given by the user) into an array at a particular valid position (given by the user) assuming that the array is not full. Insertion will take place in an user defined function, which will be called by your main() by passing the array and the position where insertion will take place. You should access the array elements by using pointers only.

(2 + 1 + 1) + 3 + 5 = 12

7. (a) Write a recursive function in C language that will print the binary equivalent of a given positive integer. Note that your program should not contain any iterations, like 'for loop', 'while loop', 'do-while loop'.

(b) What is the effect of accessing a [5] in an integer array of size 5 i.e., int a [5]?

(c) The header file string.h contains a library function strcat (string1, string2), that appends character array string2 to the character array string1. Write a C program using function that will behave exactly the same way strcat (string1, string2) behaves. Elements of character arrays will be accessed through pointers.

5 + 2 + 5 = 12

Group – E

8. (a) Write a C program which will print the executable file name when you run your program. You are also supposed to show how you run the program from the command prompt.

   (b) How can you test whether a file is opened successfully or not? Give example.

   (c) Write a C program to copy the contents of a source file to a destination file, where names of both files are supplied as command line arguments.

3 + 3 + 6 = 12

9. (a) Consider the following structure definition followed by one C statement:

```
struct student
{
        char name [30];
        int roll_number;
        int marks;
} s [2], *ptr;
ptr = s;
```

What 'ptr' will contain? If 'ptr' is increased by 1 then what it will point to?

   (b) Write a program in C to define a structure named student with members – name (string), roll (integer) and CGPA (float). It should be able to take n many students' details as input and print the details of the student who obtained highest CGPA.

   (c) Write the uses of the following file handling functions along with their proper syntax: ferror(), ftell(), rewind(), fseek().

2 + 6 + 4 = 12

Department & Section	Submission Link
AEIE	https://classroom.google.com/c/MzEyOTI5NTQ1MzU2/a/Mzc0MjE2MTk4NTg0/details
CSBS	https://classroom.google.com/c/MzExOTEwMDk0ODcw/a/Mzc0MTk4MDQ0NjY0/details
CSE - A	https://classroom.google.com/c/MzExMDM2MDMwMjg5/a/Mzc0MjIxMTM1MDU4/details
CSE - B	https://classroom.google.com/c/MzEyMTgwMTgyNzM5/a/Mzc0MjI0MjA2MDUw/details
CSE - C	https://classroom.google.com/c/MjgwODI4MDc4NDE2/a/Mzc0MTM2ODk1NjQ3/details
ECE - A	https://classroom.google.com/w/Mjk3MjI5Nzc2MDk4/t/all
ECE - B	https://classroom.google.com/c/MzEyNTE0NzAyMTc1/a/MzcxNjYwNTUwMjY1/details
ECE - C	https://classroom.google.com/w/Mjk3MjQwNTM1Mzcz/t/all
IT	https://classroom.google.com/c/MzExNjAwMzk2OTA5/a/Mzc0MjA4MTEyNTM0/details