PROGRAMMING FOR PROBLEM SOLVING
(CSE1001)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

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

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

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

(ii) Suppose x is an unsigned int variable. Executing x >> 3 is same as:
(a) x / 3 (b) x * 2^3 (c) x * 3 (d) x / 2^3

(iii) What will happen if you declare a variable but do not initialize it in C?
(a) It will be assigned a default value of 0 (b) It will contain garbage value
(c) It will cause a compile-time error (d) It will not be stored in memory

(iv) The assignment statement in line 3 of the following C code snippet is incorrect.

```
1.    char s1[50], s2[50];
2.    scanf("%s", s1);
3.    s2 = s1;
```

Which of the following C functions would you use to fix the error?
(a) strcpy() (b) strcat() (c) strlen() (d) strcmp()

(v) What will be the output of the following C program?

```
#include <stdio.h>
int func() {
    return 5;
    printf("Hello");
}

int main() {
    printf("%d", func());
    return 0;
}
```

(a) 5 (b) Hello (c) 5Hello (d) Hello5

(vi) What will be the output of the following C code snippet?

```
char str[] = "Hello";
char *p = str;
printf("%c", *(p + 1));
```

(a) H (b) e (c) l (d) None of these

(vii) What will be the output of the following C program?

```
#include <stdio.h>
#define SQUARE(x) x * x
int main() {
    printf("%d", SQUARE(3 + 1));
    return 0;
}
```

(a) 16 (b) 7 (c) 12 (d) Compilation error occurs

(viii) When fopen() is not able to open a file, it returns
(a) EOF (b) NULL
(c) Runtime error occurs (d) Value is compiler dependent

(ix) What will happen if you try to open a non-existent file using the following C statement?
FILE *fp = fopen("data.txt", "r");
(a) It will create a new file named "data.txt"
(b) It will return a NULL pointer
(c) Segmentation fault will occur
(d) The C program will not compile

(x) Which file opening mode in C will create a new file if it does not exist, and place the file pointer at the beginning without deleting the existing content?
(a) w (b) a+ (c) r+ (d) w+

Fill in the blanks with the correct word

(xi) The component of the CPU used for performing calculation and comparison operations is called the _____ .

(xii) The expression (4-5+1) || (2*3) && (3/6) evaluates to the value _____.

(xiii) The format specifier for a double-precision floating-point number in printf is _____.

(xiv) When a C function is called by _____, the actual value is passed, and changes made inside the function do not affect the original value.

(xv) The C storage class _____ is used to store a variable in the CPU register instead of RAM for faster access.

Group - B

2. (a) Describe all the steps of compilation of a C program. Mention the intermediate files generated at each step. *[(CO1)(Understand/LOCQ)]*

(b) Find the value of r such that $(355)_7 = (160)_r$, where 7 and r represent bases of number systems. *[(CO1)(Apply/IOCQ)]*

(c) Draw a flowchart to find the greatest common divisor (GCD) of two given integers. *[(CO3)(Apply/IOCQ)]*

4 + 4 + 4 = 12

3. (a) Draw a Flowchart to determine whether a given number is a perfect number. A perfect number is a number that is equal to the sum of its proper divisors. For example, the divisors of 6 are 1, 2 and 3 which add up to 6. *[(CO1)(Analyze/IOCQ)]*

(b) (i) Convert $(1423.75)_{10}$ into its equivalent octal number.
(ii) Convert $(A8F6.13B)_{16}$ into its equivalent decimal number.
Show all intermediate steps. *[(CO1)(Understand/LOCQ)]*

(c) Convert the decimal number 0.125 into IEEE 754 single precision floating point representation. *[(CO1)(Apply/LOCQ)]*

4 + 4 + 4 = 12

Group - C

4. (a) Write a C program to find the result of the given series up to the n^{th} term, where user will provide the value of n and x both of which are integers.

$$S = x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + \frac{x^9}{9} + \cdots$$ *[(CO5)(Apply/IOCQ)]*

(b) Write a C program to print this pattern (shown for 5 rows here), where the number of rows will be taken as an input from the user. Assume that the number of rows is at most 26. *[(CO5)(Apply/IOCQ)]*

```
Z Y X W V W X Y Z
  Z Y X W X Y Z
    Z Y X Y Z
      Z Y Z
        Z
```

6 + 6 = 12

5. (a) "Switch case is not always a replacement of if-else statement" – Justify this statement. *[(CO4)(Create/HOCQ)]*

(b) Write a C program to find out the minimum number of currency notes of denomination 500, 200, 100, 50, 20, 10, 5, 2, and 1 to be issued to pay a particular amount entered by the user. Hint: Using an array to access the given denomination values will reduce the length of your program. *[(CO5)(Apply/IOCQ)]*

(c) How does the continue statement different from break in loops? What happens if continue is used inside a do-while loop? Explain your answer with code snippet. *[(CO4)(Understand/LOCQ)]*

3 + 5 + (2 + 2) = 12

Group - D

6. (a) Write a program to accept the name and marks of **n** number of students in 3 subjects where n is taken as input from user. Print in descending order the rank

list based on the average of the 3 subjects. Also print the name of the first ranker along with the corresponding percentage. *[(CO6)(Apply/IOCQ)]*

(b) Write a function to calculate the sum of each row of a two-dimensional array. Also write the main() function to show the function call. *[(CO4,CO5)(Apply/IOCQ)]*

6 + 6 = 12

7. (a) Write a C program to insert a target element (given by the user) into an array at a particular valid position (also given by the user) assuming that the array is not full. Insertion will take place in a user-defined function, which will be called by your main() function by passing the array, the target element and the position as parameters. The array elements must be accessed by using pointers only. *[(CO6)(Apply/IOCQ)]*

(b) The C header file string.h contains a library function strcat (string1, string2) that appends a character array string2 at the end of the character array string1. Write a user-defined C function called **mycat( )** that will behave exactly the same way strcat behaves. Elements of the character arrays must be accessed through pointers. *[(CO4)(Apply/IOCQ)]*

(c) Given an 2D integer array A[5][10] in C, explain the difference between the following notations:
(i) *(A + i) (ii) *(*(A + i) + j)
Assume that i and j are both integers and that the values of i and j lie within the ranges (0,4) and (0,9) respectively. *[(CO4)(Analyse/LOCQ)]*

6 + 4 + 2 = 12

Group - E

8. (a) Write a C program to define a structure named ***student*** with members: ***name*** (string), ***roll*** (integer) and ***cgpa*** (float). lt should be able to accept details of **n** students where **n** is also a user input and then print the details of the student with the highest CGPA. *[(CO3,CO5)(Understand/IOCQ)]*

(b) Describe the uses of the following file handling functions along with their proper syntax and examples:
(i) ftell( ) (ii) rewind( ) (iii) fseek( ) *[(CO3, CO5)(Apply/IOCQ)]*

6 + (2 + 2 + 2) = 12

9. (a) Write a C program that counts and prints the total number of characters in a given text file. The name of the input file should be specified as a command line argument. *[(CO4,CO6)(Apply/HOCQ)]*

(b) Give examples for each of the following cases if it is feasible:
(i) Can a structure variable be defined as a member of another structure?
(ii) Can an array be included as a member of a structure?
(iii) Can an array have structure objects as elements? *[(CO4, CO6)(Understand/IOCQ)]*

6 + (2 + 2 + 2) = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	18.75	71.88	9.37