INTRODUCTION TO PROGRAMMING
(MCAP 1102)

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)   What will be the output of the following C code segment?
          ```
          #define CUBE(x)   x * x * x
          int main ( ) { printf ("%d", CUBE (2 + 3));  return 0; }
          ```
          (a) 17   (b) 125   (c) 35   (d) 18.

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

    (iii) Which of the following is *NOT* a valid C keyword?
          (a) auto   (b) include   (c) while   (d) extern.

    (iv) How many times is the body of the loop executed?
          ```
          int k;
          for (k = 0; k < 100; k = k + 3)
               printf("k = %d", k);
          ```
          (a) 100   (b) 97   (c) 34   (d) 33.

    (v)   Which of the four assignments is valid after the following declaration?
          ```
          int A[10], B[20], *C;
          ```
          (a) A = B   (b) B = C   (c) A = C   (d) C = A.

    (vi) If there is any error while opening a file, what will *fopen* return?
          (a) 1   (b) NULL   (c) EOF   (d) -1.

    (vii) What will be the output of the following C code segment?
          ```
          int main ( ) {
              int i;
              for  (i = 1 ; i < 10 ; i<<=1)
                  printf("%d", i);
              return 0 ; }
          ```
          (a) 8421   (b) 1000   (c)   1248   (d) 1111.

    (viii) The default value of a static variable is
          (a) 1   (b) 0
          (c) -1   (d) garbage value.

    (ix) *sizeof (int)* returns the length of an integer. What is *sizeof* in C?
          (a) Operator   (b) Reserved word
          (c) Function   (d) both (a) and (b).

    (x)   Which of the following takes the string *s1* and copies it into string *s2*?
          (a) s2 = (char*) s1   (b) strcpy(s1, s2)
          (c) strcpy(s2, s1)   (d) s2 = strcpy(s1).

Group – B

2. (a) Summarize the rules for naming identifiers in C language.

    (b) Draw a flowchart to find whether a number entered by the user is prime.

    (c) When writing integer constants in C language, how are decimal constants, octal constants and hexadecimal constants distinguished from one another?

    (d) During the compilation process, what happens to symbolic constants that appear within a C program?

                                                        4 + 4 + 2 + 2 = 12

3. (a) Write a pseudocode to generate the first n Fibonacci numbers.

    (b) What do you mean by scope of a variable? Explain the output of the following C program:
          ```
          int main ( ) {
              int a = 10;
              {
                  printf ("value of a is %d\n", a);
          ```

```
        a = 20;
        printf ("value of a is %d\n", a);
        {
            int a = 30;
            printf ("value of a is %d\n", a);
            a++;
        }
        printf ("value of a is %d\n", a);
        a++;
    }
    printf ("value of a is %d\n", a);
    return 0;
}
```

5 + 2 + 5 = 12

Group - C

4. (a) What is the minimum number of times that a *do - while* loop can be executed? Compare with a *while* loop and explain the reasons for the differences, if any. Illustrate it with an example.

   (b) Differentiate between the working of *break* and *continue* with examples.

   (c) Write a C program which takes as input an integer and prints the sum of the digits of the input and also the number of digits in the input.

   (1 + 3) + 3 + 5 = 12

5. (a) Differentiate among function definition, function call and function declaration.

   (b) What is a recursive function? Explain it with an example.

   (c) Write a C program using a recursive function to calculate Greatest Common Divisor of two positive integers.

   3 + (2 + 1) + 6 = 12

Group - D

6. (a) Write a C function that takes a pointer to a string as parameter and replaces all spaces in the string by '-' character and returns the number of spaces replaced.

   (b) Explain the meaning of the following declarations:
   (i) int *p(char *a [ ])
   (ii) int (*p)(char *a).

   (c) What are command line arguments?

   5 + (2 + 2) + 3 = 12

7. (a) What is dynamic memory allocation? Compare between *malloc*() and *calloc*() function.

   (b) Write a C program to find the transpose of a matrix.

   (c) What is the difference between 'A' and "A" in C language?

   4 + 6 + 2 = 12

Group - E

8. (a) What are the different types of opening modes for a file? How can you check whether a file exists by using the fopen() function?

   (b) What is a macro? Explain with example. When is it advantageous to implement a routine as a macro instead of function?

   (c) Explain the utility of *feof*( ).

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

9. (a) What is the difference between a structure variable and a union variable in respect of memory allocation?

   (b) What is a self-referential structure?

   (c) Write a C program to count the number of characters, lines and words in a text file.

   3 + 2 + 7 = 12