

Code: DC-05
Time: 3 Hours

Subject: PROBLEM SOLVING THROUGH PROGRAMMING
Max. Marks: 100

NOTE: There are 11 Questions in all.

- Question 1 is compulsory and carries 16 marks. Answer to Q. 1. must be written in the space provided for it in the answer book supplied and nowhere else.
- Answer any THREE Questions each from Part I and Part II. Each of these questions carries 14 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or best alternative in the following: (2 x 8)

a. If $x = 7$, the value of $y = (x++) * 2$ is

- (A) 9.
- (B) 11.
- (C) 16.
- (D) 8.

b. Output of the given segment will be

```
Main()  
{  
    int i ;  
    for ( i=0;i<=10;++i){  
        Print f("%d\t",i);  
    }  
}
```

- (A) gives the average of first 10 nos.
- (B) displays number from 0 to 10.
- (C) displays odd nos.
- (D) displays even nos.

c. The break statement is used to

- (A) terminate to the other loops.
- (B) terminate the control from the loop statement of the switch case structure.
- (C) switch between functions in a program.
- (D) to use switching variables.

d. External variable will be considered

- (A) the same data type throughout the program both in main and function
- (B) cannot be initialised.
- (C) initialised at once and cannot be changed at run time.
- (D) same as static variable but placed at the beginning of the program.

e. Which of the following are invalid constants?

- (A) 0.0001
- (B) 5×1.5
- (C) 9999
- (D) $-1.79e + 4$

f. If the address of 9th element in a linked list of integers is 1025, then address of 10th element is

- (A) 1024 (B) 1027
(C) 1023. (D) 1028.

g. Mathematical functions are available in which header file

- (A) stdio.h (B) stdlib.h
(C) math.h (D) io.h

h. If a = 6, the value of b = (--a) +5

- (A) 9. (B) 10.
(C) 11. (D) 12.

PART I

Answer any THREE Questions. Each question carries 14 marks.

Q.2 a. Explain the various format conversion characters used in the input statements of a program. Give examples. (6)

b. What is a compound statement? Can an expression statement be included in a compound statement. Show how? (4)

c. Describe two different ways to utilize the increment and decrement operators with examples? (4)

Q.3 a. What is a recursive function? How does a recursive function differ from an ordinary function? (6)

b. The numbers in the sequence
1, 1, 2, 3, 5, 8, 13, 21, ----- are fibonacci numbers. Write a program to calculate and print the m fibonacci numbers. (8)

Q.4 a. Explain the following loop control statement in C with example.
(i) Break statement. (ii) Continue statement.
(iii) go to statement. (6)

b. How is the register variable different from an automatic variable. Explain? (4)

c. The following is a segment of a program

```
x = 1;
y = 1;
if (n > 0)
x = x + 1;
y = y -1;
print f("%d %d", x,y);
```

 What will be the values of x & y if n assumes a value of (a) = 1, (b) =0. (4)

- Q.5** a. What is an array indexing? Summarise the rules for writing a passing array to a function? (6)
- b. A set of two linear equation with two unknowns X_1 and X_2 is given below
 $ax_1 + bx_2 = m$
 $cx_1 + dx_2 = n$ the set has unique solution
 $x_1 = \frac{md - bn}{ad - cb}$
 $x_2 = \frac{na - mc}{ad - cb}$ provided.
 The denominator $ad - cb$ is not equal to zero. Write a program that will read the values of constant a, b, c, d, m and n and compute the values of x_1 and x_2 . Appropriate message should be printed if $ad - cb = 0$. (8)

- Q.6** a. Give the result after the execution of the following segment.
 $x = 6.70;$
 $z = x;$
 $y = (x * x) / 2.0;$
 $z = (x * y) / z;$
 Print f(“% 5.2f, % 5.1f, % 5.3f”, x, y, z). (4)
- b. Write a program to find the perimeter of circle, rectangle or a triangle depending on the users option (use switch). (6)
- c. Explain the difference between function declaration and function definition? What are the rules of function declarations? (4)

PART II

Answer any THREE Questions. Each question carries 14 marks.

- Q.7** a. What is meant by following terms?
 (i) Nested structure. (ii) Array of structure. (4)
- b. Write a simple program to illustrate the method of sending an entire structure as a parameter to a function. (10)
- Q.8** a. Explain the difference between “Call by reference” and “Call by value” with examples. (4)
- b. Using pointers, write a function that receives a character string and a character as argument and deletes all occurrence of this character in the string. The function should return the corrected string with no holes. (10)

- Q.9** a. Find errors, if any in the following memory management statements.
- (i) * ptr = (int *) malloc (m, size of (int j));
 - (ii) table = (float *) calloc (100);
 - (iii) node = free (ptr); (4)
- b. Write a program to input an array and then print it in the reverse order such that the array elements are reversed and also the individual array elements are also reversed.
- Ex : 123, 45, 8275, 312
213, 5728, 54, 321. (10)
- Q.10** a. Why a linked list is called a dynamic data structure? What are the advantages of using linked list over arrays? (4)
- b. Write a function that would traverse a linear singly linked list in reverse and write out the contents in reverse order. (10)
- Q.11** a. Distinguish between the following:
- (i) Synthetic errors and semantic errors.
 - (ii) Runtime errors and logical errors.
 - (iii) Runtime errors and latent errors.
 - (iv) Debugging and testing.
 - (v) Compiler testing and Runtime testing. (2 x 5 = 10)
- b. State and explain various modes in which a file can be opened? (4)

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Q.1 Choose the correct or best alternative in the following: (2 x 8)

a. What is the output of this program?

```
int i;
main()
{
    printf("%d", i);
}
```

- (A) 0 (B) 1
 (C) -1 (D) 2

b. What will be the output?

```
main()
{
    char *p = "ayqm";
    printf("%c", ++ *(p++));
}
```

- (A) y (B) z
 (C) p (D) a

c. What is the output?

```
main()
{
    int i;
    i=5/2;
    printf ("%d",i);
}
```

- (A) 2 (B) 4
 (C) 0 (D) 1

- d. C language has been developed by
 (A) Ken Thompson (B) Larry Games
 (C) Dennis Ritchie (D) Bonn
- e. C program are converted into machine language with the help of
 (A) an interpreter. (B) a compiler.
 (C) an operating system. (D) an assembler.
- f. scanf() is not capable of receiving
 (A) multi-word strings. (B) characters.
 (C) numbers. (D) digits.
- g. exit() function is used
 (A) to enter into program.
 (B) to enter into loop
 (C) to terminate the execution of the program.
 (D) to halt.
- h. What will be the output?

```
main()
{
    printf ("%d", 3<2);
}
```

 (A) 0 (B) 1
 (C) -1 (D) 2

PART I

Answer any THREE Questions. Each question carries 14 marks.

- Q.2** a. What is ternary operator? Explain with the help of an example. (4)
 b. Differentiate between constants, variables & keywords with the help of examples. (4)
 c. Write C program to check whether a given integer is a even or odd. (6)
- Q.3** a. Given two variables of integer type x and y, exchange their values without using a third temporary variable. (4)
 b. Write a C program to generate first n terms of a fibonacci series. (10)
- Q.4** a. What is an array? Explain call by value & call by reference with the help of examples. (6)
 b. Define the following:

- (i) Top Down approach
- (ii) Bottom Down approach. (8)

Q.5 a. Write a C program to generate the multiplication table of an integer number 'n'. For example if n = 2 then the following table is to be generated.

```

( 2*1 = 2
  2*2 = 4
  .....
  .....
  2*10=20)
```

(6)

b. Write a C function to find the factorial of a number by using recursion. (8)

Q.6 a. What is a pointer? Write a program to generate a sum of two numbers by using pointers. (7)

b. Differentiate between 'array' and 'structure'. Write structure definition for a student containing the information: {name, age, department, address}. (7)

PART II

Answer any THREE Questions. Each question carries 14 marks.

Q.7 Explain the following:

- (i) Basic path testing.
- (ii) Black box testing. (14)

Q.8 a. What is sorting? Write a C program to sort numbers in descending order by using bubble sort method. (8)

b. Write a C program to find maximum of 'n' integers. (6)

Q.9 a. Write a C program to copy strings without using strcpy() function. (7)

b. Write a C program to count the number of words in a given text. (7)

Q.10 a. You are given a single linked list. Write a C function that returns the number of nodes in the list. (7)

b. Write a C program to reverse the elements of an array. (7)

Q.11 a. Write a C program to remove all blank lines from a file. (7)

b. Write a C program to read a text file and write the text onto another file after removing punctuation symbols (, . ;). (7)

DEC./2003

Code: DC-05
Time: 3 Hours

Subject: PROBLEM SOLVING THROUGH C++
Max. Marks: 100

NOTE: There are 11 Questions in all.

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- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or best alternative in the following: (2 x 8)

- a. A relational operator
- (A) assigns one operand to another. (B) yields a Boolean result.
(C) adds two operands. (D) logically combines two operands.
- b. In a for loop with a multi statement loop body, semicolons should appear
- (A) in the for statement itself.
(B) in the closing brace in a multi statement loop body.
(C) in each statement with in the loop body.
(D) after the test expression.
- c. If the address of the 5th element in an array of double integers is 2020, then the address of 4th element is
- (A) 2021. (B) 2019.
(C) 2022. (D) None of these.
- d. When accessing a structure member, the identifier to the left of the dot operator is the name of
- (A) a structure member. (B) a structure tag.
(C) a structure variable. (D) the keyword struct.
- e. Which of the following can not be legitimately passed to a function
- (A) a constant. (B) a structure.
(C) a variable. (D) a header file.

f. What will be the output if zzz.c exists in the current directory?

```
#include<stdio.h>
main()
{
    FILE *fp;
    unsigned char i;
    fp = fopen ("zzz.c", "r");
    while ((i=fgetc (fp)) !=EOF)
        printf("%c", i);
}
```

- (A) Error.
- (B) None of these.
- (C) Contents of zzz.c
- (D) Contents of zzz.c followed by an infinite loop.

g. Which of the following is not a valid variable name

- (A) volume.
- (B) function.
- (C) matrix.
- (D) area.

h. The output of the code

```
sum = 0;
for (i = 1; i <=10; i++) {
    sum++
}
printf ("%d \n", sum);
is
```

- (A) 0
- (B) 50
- (C) 10
- (D) None of these.

PART I

Answer any THREE Questions. Each question carries 14 marks.

- Q.2**
 - a. Write a C program that converts a given number in inches to an equivalent length in centimetres. You are given that 39.37 inches is one meter. (7)
 - b. Write a C program that reads a text of 80 characters and outputs number of vowels. (7)
- Q.3**
 - a. What is the difference between a 'while' and 'do-while' loop? Explain with the help of an example. (5)
 - b. Write a C program using 'for' loop to display all the even numbers between 1 and 100. (7)
 - c. What will be the output of the following program?


```
main()
{ int k = 15, j;
  j = ((++k) -1 ) / k;
}
```

 (2)

- Q.4** a. Write a program to calculate and print roots of a quadratic equations given below :
 $ax^2 + bx + c = 0$ (10)
- b. What is a function? State its advantages. (4)
- Q.5** a. Write a program in C to find the sum of the following series
 $(1) + (1+2) + (1+2+3) + (1+2+3+4) \dots$ upto n terms. The value of n is to be entered by the user. Make use of function. (10)
- b. Differentiate between call by reference and call by value. (4)
- Q.6** a. What is top-down methodology? What are its advantages? (3)
- b. Differentiate between pointer(*) and the address (&) operator using examples. (3)
- c. What are different logical operators? Explain each of them. (4)
- d. Explain design and testing phases of program development. (4)

PART II

Answer any THREE Questions. Each question carries 14 marks.

- Q.7** a. What are unions? What is the difference between a union and a structure? Explain with suitable example. (6)
- b. Write a structure for book information containing title of the book, author name, price, year of publication and edition. (4)
- c. What are user defined data type? Why do we need them? (4)
- Q.8** a. Write a recursive function in C to compute greatest common divisor of two numbers n and m. (7)
- b. Write a C program to multiply two matrices of order $n \times m$, $m \times p$ respectively. (7)
- Q.9** Write a C program to insert and delete an integer data in a linked list arranged in ascending order. The structure of a node is as shown below:- (14)



- Q.10** a. Describe the following terms and give example of each.
(i) scanf ()
(ii) fgets ()
(iii) getch ()
(iv) fopen () (8)
- b. State and explain different modes in which a file can be opened. (4)
- c. Define interpreter and compiler. (2)
- Q.11** a. Write a C program that reads a text file and output the number of vowels in it. (6)
- b. Write a C program that reads input file of structures containing name, rollno, and marks. Display the name and rollno of student having highest marks. (8)

JUNE/2004

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Q.1 Choose the correct or best alternative in the following: (2 x 8)

- In a 'C' program, constant is defined
 - before main.
 - after main.
 - anywhere, but starting on a new line.
 - None of the above.
- If abc is the input, then the following program fragment results in


```
char x, y, z;
printf("%d", scanf("%c%c%c", &x, &y, &z));
```

 - a syntax error.
 - a fatal error.
 - segmentation violation.
 - printing of 3
- If integer needs two of storage, then maximum value of a signed integer is

(A) $2^{16} - 1$	(B) $2^{15} - 1$
(C) 2^{16}	(D) 2^{15}
- Output of the following program fragment is


```
x = 5;
y = ++x;
printf("%d%d", x, y);
```

(A) 5, 6	(B) 5, 5
(C) 6, 5	(D) 6, 6
- Output of the following program fragment is


```
int x=2, y=5, z=1, a;
a = x < y < z;
printf("%d", x);
```

(A) 1	(B) 0
(C) error	(D) 5
- Which of the following is not a valid character constant?

(A) 'a'	(B) '\$'
(C) '\n'	(D) 'xyz'
- What is the output of the following program fragment?


```
int a=5, *b =&a;
printf("%d %d", a, b);
```

(A) 5 5	(B) garbage
(C) 5 Address of b	(D) error message
- Choose the correct answer
 - An entire array can be passed as argument to a function.

- (B) An array is passed to function by value.
- (C) Any change done to an array, passed as an argument to function will be local to function only.
- (D) None of these.

PART I

Answer any THREE Questions. Each question carries 14 marks.

- Q.2**
- a. Write a C program that reads an unsigned integer X and displays the leftmost digit of it. (6)
 - b. Given the values of the variables X, Y and Z, write a C program to rotate their values such that X has value of Y, Y has value of Z and Z has value of X. Read the values and display after rotation. (4)
 - c. Output the number $y = 256.667$ under the following format specification.
 - 1. `printf("%7.2f", y)`
 - 2. `printf("%f", y)`
 - 3. `printf("8.2e", y)`
 - 4. `printf("%e", y)` (4)
- Q.3**
- a. (i) Why and when do we use #define directive?
 (ii) What does void main(void) mean?
 (iii) What is the difference between getchar and scanf functions? (6)
 - b. Write a C program using "while" construct to find out the number of persons in age group between 40 to 60. Read the ages of 100 persons and print the result. You are not allowed to use array. (5)
 - c. Write conditional operators to evaluate the following function

$y = 20.5,$	$\text{for } x = 0$
$y = 4.8x - 3,$	$\text{for } x < 10$
$y = 3x + 5,$	$\text{for } x > 10$

 (3)
- Q.4**
- a. State what (if anything) is wrong with each of the following statements / segments:
 - (i) `printf ("%f, %d, %s, price, count, city)`
 - (ii) `double root;`
`scanf (\n"%f", root);`
 - (iii) `if (p < 0) || (q < 0)`
`printf("sign is negative");`
 - (iv) `while (count != 8);`

```

          {
            count=1;
            sum=sum+x;
            count=count+1;
          }
        
```
 Assume that all the variables have been declared and assigned values. (4x2=8)
 - b. Write a C program to count the number of vowels in a given input string. Read the string and display the result. (6)
- Q.5**
- a. Write a C program to convert any typed input into capital letters. (5)
 - b. What is the output of the following program?

```
main()
{int k, x = 0;
for (k=1; k <50; k*=2)
{      x++;
      printf("%d ",x);
}
printf("\n x = %d k=%d", x, k);
}
```

(4)

- c. Write a C program which uses gets and puts to double space typed input. (e.g, if input is "abcde" then output will be "a b c d e"). (5)

Q.6 a. (i) What would be the output of the following code segment?

```
count = 7;
while (count -- > 0)
printf (count);
```

(ii) Determine how many times the body of loop will be executed?

```
x = 7;
y = 70;
while (x <= y)
{  x = y / x;
  ---
  --- }
```

(iii) Change the following 'for loop' to 'while loop'

```
for (x=1; x<10; x=x+1)
printf(x);
```

(iv) Determine the value of the following expression

```
if a=5, b=10 and c = -6
a < b && a > c
```

(4 x 2 = 8)

- b. Write a switch statement that will examine the value of a char type variable 'color' and print the following messages: (6)

It is Red colour, if color has value either r or R
 It is Blue colour, if color has value either b or B
 It is Green colour, if color has value either g or G
 It is White colour, if color has any other value

PART II

Answer any THREE Questions. Each question carries 14 marks.

- Q.7** a. Define a structure consisting of two floating point members called real and imaginary. Include the tag complex within the definition. (3)
 b. Declare a one dimensional complex array called 'carray' of 100 elements. (2)
 c. Write a C program to input 'carray' defined above. Compute the sum of all 100 complex numbers and print it. (9)

- Q.8** a. Compare, in terms of their functions, the following pairs of statements:
 (i) while and for.
 (ii) break and goto.
 (iii) break and continue. (6)
 b. The following set of numbers is popularly known as Pascal's triangle. If we denote rows by i and columns by j, then any element except boundary

elements in the triangle are given by $X_{ij} = X_{i-1,j-1} + X_{i-1,j}$. Write a C program to calculate the elements of Pascal triangle for 10 rows and print the result. Few rows have been shown below. (8)

```

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
....

```

- Q.9**
- a. Write a C function that fills up an upper left triangle of $N \times N$ matrix with 1. (6)
 - b. (i) Which of the following expressions are valid? If valid, give the value of the expression; otherwise give reason.
 - $21\% (\text{int}) 4.5$
 - $(5/3) * 3 + 5 \% 3$ (2)
 - (ii) Which of the following expressions are true
 - $!(5 + 5 >= 10)$
 - $10! = 15 \ \&\& \ ! (10 < 20) \ || \ 15 > 30$ (2)
 - (iii) What is a null statement? Explain a typical use of it. (2)
 - (iv) How does a structure differ from an array. (2)

- Q.10**
- a. Define a self-referential structure containing the following three members.
 - (i) a 40-element character array called 'name'
 - (ii) a structure called 'stats' of type record containing two members {int, float}
 - (iii) a pointer to another structure of this same type called 'next' (6)
 - b. Write a C statement that will allocate an appropriate block of memory with ptr (a pointer to the structure defined above) pointing to the beginning of the memory block. (2)
 - c. Write short notes on any **THREE** of the following topics:
 - (i) Structured programming
 - (ii) Top down approach of program development
 - (iii) Program efficiency
 - (iv) Difference between compiler and interpreter (6)

- Q.11** a. The skeletal outline of C program is shown below:

```
main()
{ FILE *p, *q;
  int a;
  float b;
  char c;

  p = fopen("sample.old", "r");
  q = fopen("sample.new", "w");

  fclose(p);
  fclose(q);
}
```

- (i) Read the values of a, b and c from the data file sample.old.
- (ii) Display them on screen.
- (iii) Write new values to data file sample.new. (6)

b. Explain the meaning and purpose of the following:

- (i) Template.
- (ii) Size of operator.
- (iii) typedef.
- (iv) float. (8)