B1.3-R3: PROGRAMMING AND PROBLEM SOLVING THROUGH 'C' LANGUAGE

NOTE:

1.	There are **TWO PARTS** in this Module/Paper. **PART ONE** contains **FOUR** questions and **PART TWO** contains **FIVE** questions.
2.	**PART ONE** is to be answered in the **TEAR-OFF ANSWER SHEET** only, attached to the question paper, as per the instructions contained therein. **PART ONE** is **NOT** to be answered in the answer book.
3.	Maximum time allotted for **PART ONE** is **ONE HOUR**. Answer book for **PART TWO** will be supplied at the table when the answer sheet for **PART ONE** is returned. However, candidates, who complete **PART ONE** earlier than one hour, can collect the answer book for **PART TWO** immediately after handing over the answer sheet for **PART ONE**.

TOTAL TIME: 3 HOURS   **TOTAL MARKS: 100**
(PART ONE – 40; PART TWO – 60)

PART ONE
(Answer all the questions)

1.   **Each question below gives a multiple choice of answers. Choose the most appropriate one and enter in the "tear-off" answer sheet attached to the question paper, following instructions therein.   (1 x 10)**

1.1 The following is a program

```
Main()
    {
        int x = 0;
        while(x<=10)
        for( ; ; )
            if( ++ x%10 = =0)
                break;
        printf("x = %d", x);
    }
```
What will be the output of the above program?
A)   Will print x = 10
B)   Will give compilation error
C)   Will give runtime error
D)   Will print x = 20

1.2 Consider the following variable declaration

```
Union x{
        int i;
        float f;
        char c;
    }y;
```

---

if the size of i, f and c are 2 bytes, 4 bytes and 1 byte respectively then the size of the variable y is:-

A) 1 byte
B) 2 bytes
C) 4 bytes
D) 7 bytes

1.3 Pick up the odd one out from the following
A) x = x – 1
B) x - = 1
C) x - -
D) x = - 1

1.4 What is the value of 'average' after the following program is executed?

```
main()
    {
    int sum, index;
    float average;
    sum = 0;
    for( ; ; ) {
          sum = sum + index;
          ++ index;
          if (sum > = 100) break;
              }
    average = sum / index;
    }
```

A) 91/13
B) 91/14
C) 105/14
D) 105/15

1.5   Suppose i, j, k are integer variables with values 1, 2, 3 respectively. What is the value of the following expression?

```
! (( j + k ) > (i + 5 ))
```

A) 6
B) 5
C) 1
D) 0

1.6 If a = -11 and b = -3. What is the value of a % b?
A) - 3
B) - 2
C) 2
D) 3

1.7 If c is a variable initialized to 1, how many times will the following loop be executed?

```
while (( c > 0 && (c < 60))
    {
    c ++;
    }
```

A)   61
B)   60
C)   59
D)   1

1.8 Which one of the following describes correctly a static variable?
A)   This cannot be initialized.
B)   This is initialized once at the commencement of execution and cannot be changed at run
        time.
C)   This retains its value through the life of the program.
D)   This is same as an automatic variable but is placed at the head of a program.

1.9 What will be the output of the following program?
```
main()
    {
    int  a, *ptr, b, c;
    a = 25;
    ptr = &a;
    b = a + 30;
    c = *ptr;
    printf("%d %d %d", a, b, c);
    }
```
A)   25, 25, 25
B)   25, 55, 25
C)   25, 55, 25
D)   None of the above

1.10 If a = 0×aa and b = a << 1 then which of the following is true
A)   b = a
B)   b = 2a
C)   a = 2b
D)   b = a - 1

2. **Each statement below is either TRUE or FALSE. Choose the most appropriate one and ENTER in the "tear-off" sheet attached to the question paper, following instructions therein.** **(1 x 10)**

2.1 It is not possible to print the % character as the function `printf` treats % as the beginning of a conversion specification.

2.2 A structure can include one or more pointers as members.

2.3 It is not possible to have formatted input / output in 'C'.

2.4 It is not possible to have nested if – else statements in 'C'.

2.5 The increment operator ++ does not work with float variable.

2.6 *a is the same as a[ ] in a parameter declaration.

2.7 In 'C' programming language, strings are represented using an array.

2.8 Relational operators have higher precedence than arithmetic operators.

2.9 A structure cannot be a member of a union.

2.10 *p++ increments the content of the location pointed by p.

3. **Match words and phrases in column X with the closest related meaning/ word(s)/phrase(s) in column Y. Enter your selection in the "tear-off" answer sheet attached to the question paper, following instructions therein.** **(1 x 10)**

X	Y
3.1 An Operator in 'C' permits two different expressions to appear in situations where only one expression is ordinarily be used.	**A.** The operator &&
3.2 Variables, internal to a function, come into existence when the function is called	**B.** Static variables
3.3 No space allocated for storage of character during compilation time	**C.** Global variables
3.4 p is pointer to a function that returns a pointer to integer	**D.** The comma operator (,)
3.5 Self-referencing structure	**E.** int *p[10]
3.6 Accomplishing indirection with pointer to structure	**F.** automatic variable
3.7 Random access in the file; file specified through file descriptor	**G.** Useful for link-list implementation
3.8 Returns initialized storage in run-time	**H.** seek
3.9 Variables can be defined in 'C' which occupies less space than character variables	**I.** fseek
3.10 Valid mode for opening a file; permits read and write	**J.** calloc
	K. w+
	L. malloc
	M. r+
	N. bit-fields
	O. arrow operator
	P. int(*(*pc))
	Q. char *s

4. **Each statement below has a blank space to fit one of the word(s) or phrase(s) in the list below. Enter your choice in the "tear-off" answer sheet attached to the question paper, following instructions therein.** **(1 x 10)**

A.	Change	B.	trinary	C.	- operator
D.	Automatic	E.	Variable	F.	"&" operator
G.	Static	H.	Dynamically	I.	Externally
J.	void	K.	A character	L.	An integer
M.	EOF	N.	fclose	O.	True

4.1   printf( ) function uses _____ number of arguments.

4.2   _____ can be used as both binary and unary operators.

4.3   Link lists can be created _____.

4.4   Loop invariants are assertions that remain _____ before and after execution of loops.

4.5   File descriptor is _____.

4.6   Pointer arguments enable a function to access and _____ objects defined in the calling routine.

4.7   The function getchar( ) returns _____ when there is no more input character.

4.8   Any pointer can be cast to _____ without loss of information.

4.9   To prevent the use of functions across different files, ____ storage class is used.

4.10   ? : is _____ operator.

PART TWO
(Answer any **FOUR** questions)

5.
a) Discuss with the help of examples the action of break statement and the continue statement.
b) Does the null statement have any uses besides indication that the body of a loop is empty? Explain.
c) What is the purpose of the \? Escape sequence?

(8+4+3)

6.
a) Is it legal to put a function declaration inside the body of another function? If yes, give an example.
b) Is it legal for a function f1 to call f2, which then calls f1? Justify your answer.
c) Write a 'C' function that returns the k-th digit from the right in the positive integer n. For example, digit(829,1) returns 9, digit(829,3) returns 8. If k is greater than the number of digits in n then the function is to return –1. Include appropriate documentation in your program.

(4+2+9)

7.
a) If a pointer is an address, what does the expression like p + j mean?
b) Is i[a] same as a[i]? Justify your answer.
c) Write the following function:
```
Bool search(int a[], int n, int x);
```
Where a is an array to be searched, n is the number of elements in the array, and x is the search key. "search" should return TRUE if x matches some element of a, FALSE if it doesn't. Use pointer arithmetic to visit array elements. Include appropriate documentation in your program.

(4+2+9)

8.
a) Develop an algorithm to do the following:
Read an array of 20 elements and then send all negative elements of the array to the end without altering the original sequence.
b) Draw a flow chart and then write a 'C' program to generate first 15 members of the following sequence.
1, 3, 4, 7, 11, 18, 29, …

(5+10)

9. Develop a flowchart and then write a program for analyzing a line of text stored in a file by examining each of the characters and displaying into which of several different categories vowels, constants, digits, white spaces it falls. Count of the number of vowels, consonants, digits and white space characters. Include an appropriate documentation in your program.

(15)