

## M4.1-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 Which of the following is a valid octal constant?

- A) 32
- B) 032
- C) 049
- D) 0x49

1.2 Which of the following switch statement is not a valid statement to print “RED” if a character variable ‘color’ has the value ‘R’ or ‘r’?

- A) `switch (color) { case 'R': case 'r': printf("RED"); break; }`
- B) `switch (color) { case 'R': printf("RED"); break; case 'r' : printf("RED"); break; }`
- C) `switch (toupper(color)) { case 'R': printf("RED"); break; }`
- D) `switch (color) { case 'R' || 'r' : printf("RED"); break; }`

1.3 What will be the output of the following code segment, if the function is called as `larger(10, 20)` ?

```
int larger(int x, int y) {
    int max = x;
    if (max < y) {
        max = y;
        return y;
    }
    else
        return x;
    printf("Larger of %d and %d is %d", x, y, max);
}
```

- A) Program will not compile as the function has two return statements.
- B) Program will not compile as no statement is allowed after return statement.
- C) Larger of 10 and 20 is 20.
- D) No output.

1.4 Given the code segment:

```
char a[] = "abc", *p;
```

Which of the following assigns the starting address of the string "abc" to p?

- A) p = a;
- B) p = &a;
- C) p = \*a;
- D) \*p = a;

1.5 To read and write an existing file without overwriting, the following mode is used.

- A) r
- B) w
- C) r+
- D) w+

1.6 If an array is defined as **static char a[10];** then the elements of a will be set to

- A) an undetermined value
- B) zero
- C) blank character
- D) character '~0'

1.7 For the code segment

```
struct DOB { int date, month, year;};
struct person { char name[30];
                struct DOB birthdate; } p, *ptr = &p;
```

Which of the following is not a valid expression to access year of birth date?

- A) ptr -> birthdate.year
- B) (\*ptr). birthdate.year
- C) ptr.birthdate.year
- D) p.birthdate.year

1.8 Which of the following statement is false for the statement?

```
main(int ac, char *av[])
```

- A) av is an array of pointers to strings.
- B) av[0] represents the name of the program under execution.
- C) the formal arguments names have to be argc and argv only.
- D) the main function can return an integer to the calling function/program.

1.9 What will be the output of the following?

```
main() {
    int a = 'A';
    printf("%d", a);
}
```

- A) 65
- B) A
- C) a
- D) the program will not compile as an integer variable is assigned a character constant.

1.10 Consider the following code segment:  
for (odd\_sum = 0, j = 1; \*\*\* ; j += 2)  
    odd\_sum += j;

In order to sum all the odd numbers between 1 to 100; which of the following statements cannot replace \*\*\*?

- A) j <= 99
- B) j < 99
- C) j <= 100
- D) j < 100

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 An escape sequence begins with a backward slash followed by an alphabetical character.
- 2.2 The for loop can be used only for the cases when the number of passes is known in advance.
- 2.3 Let an array **arr** be a member of a structure **s**. If **s** is passed to a function, **test** as **test(s)**, then the changes in **arr**, if any, by **test** will not be reflected in the calling function.
- 2.4 In a recursive function with local variables, a different set of local variables with the same name are created during each call.
- 2.5 Two enumeration constants defined in an enumeration definition can have same integral value.
- 2.6 The **sizeof** operator can only be used with variables that are allocated space using malloc() function.
- 2.7 If u is a union variable, then using isalpha(u) it is possible to know whether u is storing an alphabet or not.
- 2.8 If a file is created with fwrite() function, then it is valid to read it using fscanf() function.
- 2.9 NULL is a keyword in C.
- 2.10 A function name can be passed as an argument to another function.

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	Self referential data structure	A.	Arrays
3.2	Converting to a different data type	B.	Flowchart
3.3	Creating new data type	C.	while(0)
3.4	Removing repetitive coding	D.	Register variables
3.5	Infinite loop	E.	Recursion
3.6	Pictorial representation of logic	F.	Function
3.7	Request to compiler	G.	Declaration
3.8	Defining constants	H.	typedef
3.9	Global variables	I.	#define
3.10	Space allocation to variables	J.	Static
		K.	Algorithm
		L.	Linked lists
		M.	type casting
		N.	Definition
		O.	External variables
		P.	for( ; ; )

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.	actual	B.	4	C.	character
D.	false	E.	self-referential structure	F.	formal
G.	stream oriented	H.	heterogeneous	I.	declaration
J.	1	K.	5	L.	text
M.	unknown	N.	non linear	O.	union
P.	pointer	Q.	0	R.	linear
S.	sparse array	T.	true	U.	unformatted
V.	definition	W.	Integer	X.	linked list

- 4.1 The data structure with most of the entries as 0 (zero) is a(n) \_\_\_\_\_.
- 4.2 A null terminated array of \_\_\_\_\_ is a string.
- 4.3 A constant can be valid \_\_\_\_\_ argument to a function.
- 4.4 The statement **struct point { int x, y;};** is a structure \_\_\_\_\_.
- 4.5 Linked list is a \_\_\_\_\_ data structure.
- 4.6 The expression **pv + 3** is valid but not **pv \*3** if pv is a(n) \_\_\_\_\_ variable.
- 4.7 A(n) \_\_\_\_\_ file can be created with specially written program only.
- 4.8 The size of an array defined as **char color[] = “BLUE”;** is \_\_\_\_\_.
- 4.9 In expression  $((j + k > 10) \parallel (n > -3))$ ,  $(n > -3)$  will be evaluated if  $(j + k > 10)$  is \_\_\_\_\_.
- 4.10 The loop **do { ... } while (0);** will be executed \_\_\_\_\_ times.

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

5.

- a) Write a 'C' program to compute the following series:

$$1 - x + x^2/2 - x^3/6 + x^4/24 + \dots + (-1)^n x^n/n!$$

Where n and x is to be accepted by the user.

- b) Develop a flowchart and then write a 'C' program to sort strings passed to the program through the command line arguments. Also display the sorted strings.

**(6+9)**

6.

- a) Define a structure to store roll\_no, name and marks of a student.  
b) Using the structure of **Q6. a)**, above write a 'C' program to create a file "student.dat". There must be one record for every student in the file. Accept the data from the user.  
c) Using the "student.dat" of **Q6. b)**, above write a 'C' program to search for the details of the student whose name is entered by the user.

**(3+6+6)**

7.

- a) Write a 'C' function to reverse a singly linked list by traversing it only once.  
b) Write a 'C' function to remove those nodes of a singly linked list which have duplicate data. Assume that the linked list is already in ascending order.

**(7+8)**

8.

- a) What do you understand by loading and linking of a program?  
b) Write a 'C' function to generate the following figure for n = 7.

```

                1
               1 3
            1   3 5
           1   3 5 7
          1   3 5
         1   3
        1

```

The value of n is passed to the function as an argument. Print the triangle only if n is odd otherwise print an error message.

- c) Write a 'C' function to arrange the elements of an integer array in such a way that all the negative elements are before the positive elements. The array is passed to it as an argument.

**(3+6+6)**

9.

- a) Write a recursive function in 'C' to count the number of nodes in a singly linked list.  
b) Develop a flowchart and then write a 'C' program to add two very large positive integers using arrays. The maximum number of digits in a number can be 15.

**(5+10)**