

MMT-001

ASSIGNMENT BOOKLET

**M.Sc.(Mathematics with applications to computer science)
Programming and Data Structures
(Valid from 1st January, 2021 to 31st December, 2021)**



**School of Sciences
Indira Gandhi National Open University
Maidan Garhi, New Delhi
(For January 2021 cycle)**

Dear Student,

Please read the section on assignments in the Programme Guide for elective Courses that we sent you after your enrolment. A weightage of 30%, as you are aware, has been earmarked for continuous evaluation, **which would consist of one tutor-marked assignment** for this course. The assignment is in this booklet.

Instructions for Formatting Your Assignments

Before attempting the assignment please read the following instructions carefully.

- 1) On top of the first page of your answer sheet, please write the details exactly in the following format:

ROLL NO. :.....

NAME :.....

ADDRESS :.....

.....

.....

COURSE CODE :

COURSE TITLE :

STUDY CENTRE :

DATE.....

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

- 2) Use only foolscap size writing paper (but not of very thin variety) for writing your answers.
- 3) Leave a 4 cm margin on the left, top and bottom of your answer sheet.
- 4) Your answers should be precise.
- 5) While solving problems, clearly indicate which part of which question is being solved.
- 6) This assignment is to be submitted to the Study Centre as per the schedule made by the study centre. **Answer sheets received after the due date shall not be accepted.**
- 7) This assignment is valid only up to 31st December, 2021. If you fail in this assignment or fail to submit it by 31st December, 2021, then you need to get the assignment for the year 2022 and submit it as per the instructions given in the Programme Guide.
- 8) **You cannot fill the Exam form for this course till you have submitted this assignment. So solve it and submit it to your study centre at the earliest.**
- 9) **We strongly suggest that you retain a copy of your answer sheets.**

We wish you good luck.

Assignment

Course Code: MMT-001
Assignment Code: MMT-001/TMA/2021
Maximum Marks: 100

- 1) a) Explain how you will print a newline and a tab character on a computer screen. (2)
- b) What do the symbols * and & mean, when they are placed in front of an identifier? Explain with an example for each. (3)
- c) The following piece of 'C' code is supposed to compute the volume of a cylinder. Find the syntax and logical errors, if any, in it. (3)

```
float radius, height, volume;  
float constant pi = 22/7;  
printf("Please enter the radius of the cylinder.");  
scanf("%d", &radius);  
printf("Please enter the height of the cylinder.");  
scanf("%f", &height);  
volume == 4 * pi * radius * radius * height;  
printf("The volume of the cylinder is :", volume);
```

- d) What is the difference between a variable and a constant in C? Explain with the help of an example. (2)
- 2) a) A programmer wrote the following code to compute the binomial coefficients.

```
int C(int n, int r)  
{  
    int i, p = 1;  
    for(i=r; i>=1; i--)  
        p = p*(n-r+i)/i;  
    return p;  
}
```

Does it compute the binomial coefficients correctly? If not, what is wrong with this code and how will you correct it? (4)

- b) Arrange the following operators in descending order of their priority. If any two operators have the same priority, then specify their associativity. (4)
+ = % + [] != - () - >
 - c) What does happen in each of the following situations? (4)
 - i) a function returns a value but it is not assigned to anything
 - ii) a function is assigned to an object but that function returns no value
 - d) Give an example to illustrate the use of ternary **if-then-else** statement. (3)
- 3) a) What is wrong with the following declaration? Explain. (2)
float *number = 2.30;
 - b) How are the arguments of scanf() different from an ordinary function? Explain. (3)
 - c) Find the output of the program given in E6 of Unit 8. Does this make you clear about the use of the extern variable? (5)

d) Write a program using **switch** statement which takes two integers and an operator from the keyboard. If the operator entered through the keyboard is any one of the operators +,-,*,/, then the program performs that operation and prints the result. If the operator entered is other than the mentioned above, the program prints the string "**Operation cannot be performed**". Your program should also print on appropriate message whenever division by occurs. (5)

4) a) Assuming the declarations

```
int a [5] = { 10,20,30,40,50};
int *ptr_a, *ptr = NULL;
int number, i;
ptr_a = &a;
```

Find errors in the following statements, if any, and do the necessary corrections. (5)

- i) ++ptr_a;
- ii) number =ptr_a;
- iii) number =*ptr_a[2];
- iv) **for** (i=0; i<5; i++)
printf ("%d",ptr_a[i]);
- v) number = *ptr;

b) Define a function isprime() which takes a positive integer and returns 1 if the number is prime and 0 otherwise. Use this function to define another function called num_of_primes() which takes two natural numbers p and q (where $p < q$) and returns the number of primes between them. (5)

c) What do you understand by a macro? Define a macro to find the maximum of two numbers. Using this define a function maximum() which takes four numbers as parameters and returns their maximum (4)

d) Explain the difference between the following with an example for each. (6)

- i) L-values and R-values
- ii) global and local variable
- iii) automatic and static variable

5) a) Write a program that prints the following shape made of *'s. (5)

```

      *      *      *
     *      *      *
      *  *  *
        *

```

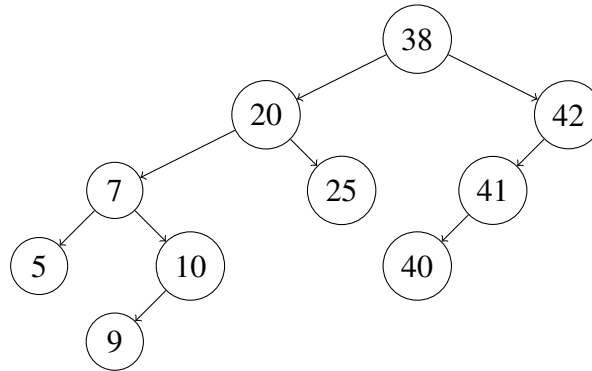
b) Write statements to accomplish each of the following. Assume the structure

```
struct person
{
    char lastName [10];
    char City [20];
    int Age;
};
```

has been defined and that the file is already open for writing.

- i) Initialize the file "personaldata.dat" so that there are 100 records with lastName="", City=" " and Age = 0.
- ii) Input 10 last names, first names and ages and write them to the file (5)

- 6) a) Manually provide the inorder, preorder, postorder and level by level traversals of the following binary search tree. (4)



- b) How will you store the following sparse matrix in vector and linked list representation so that only nonzero elements are stored? (4)

$$\begin{bmatrix} 4 & 0 & 0 & 0 & 2 \\ 0 & 0 & 2 & 1 & 0 \\ -1 & 3 & 0 & 0 & 1 \\ 0 & 0 & 6 & 0 & 0 \\ 3 & 0 & 0 & 6 & 0 \end{bmatrix}$$

- c) Based on Example 5 in Unit 12, write functions to add and multiply polynomials.(7)

- 7) a) Write a statement or a set of statement to accomplish each of the following. Assume that all the manipulations occur in main and assume the following definitions (7)

```

struct TTtwenty
{
char Name [15];
struct TTtwenty *Next;
};
typedef struct TTtwenty *T20;
typedef T20 *ptr_T20;
  
```

- i) Create a pointer to the start of the list called start_ptr. The list is empty.
- ii) Create a node of type T20 that is pointed to by pointed new_ptr of type ptr_T20. Assign the string "sachin" to member Name and the value 96 to the member Total_Runs. Provide any necessary declarations and statements.
- iii) Write a **while** loop that prints the data in each node of the list.

- b) Consider the following declaration

```

typedef struct node
{
char Course_Grade;
struct node *Next;
} Student;
  
```

For the above declaration, the following function display the grades of a student in different course.

```
void Display_Grades (Student* S)
{
    if (Is_Empty (S))
        printf ("The stack is Empty!");
    else
    {
        printf ("printing the grades of courses ...n");
        while (s->Next!=NULL)
        {
            printf ("%c n",s->Course_Grade);
            s=s->Next;
        }
        printf ("%c n",s->Course_Grade);
    }
}
```

Does it display all the grades? If not, do the necessary modifications so that it displays all the grades. Also write the definition of the function Is_Empty(). Also write down the corresponding Push() and Pop() functions. (8)