

**M.Sc. (MATHEMATICS WITH APPLICATIONS
IN COMPUTER SCIENCE)**

M.Sc. (MACS)

Term-End Examination

June, 2022

**MMT-001 : PROGRAMMING AND DATA
STRUCTURES**

Time : $1\frac{1}{2}$ hours

Maximum Marks : 25

(Weightage : 20%)

***Note :** Question no. 1 is **compulsory**. Answer any **three** questions from questions no. 2 to 5. All programs should be written in 'C' language only. Use of calculator is **not** permitted.*

1. Write the output of the following segments of code. Justify your answer with short explanations. $5 \times 2 = 10$

(a) `main()
{ int a[5];
 a[3] = 10;
 printf("%d", *(a + 3));
}`

(b) `# define min(a, b) (a < b ? a : b)`

```
main()
{ int x;
  x = min(1 + 3, 2 + 1);
  printf("%d", x);
}
```

(c) `main()`

```
{ struct {
    int i;
    } *xyz;
(* & xyz) → i = 10;
printf("%d", xyz → i);
}
```

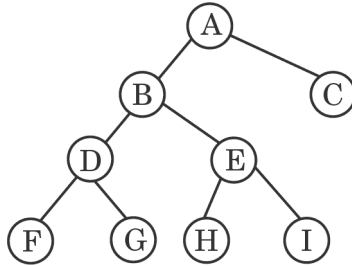
(d) `main()`

```
{ int i = 5;
  printf("%d", i = i == 6);
}
```

(e) `main()`

```
{ int i = 7, j = 8;
  printf("%d", i++ - ++j);
  return 0;
}
```

2. (a) Write Preorder and Inorder traversal of the binary tree given below : 2



- (b) Convert the following nested do-while loop into a nested for loop : 3

```
i = 0;
do
{
    i = i + 1;
    j = i;
    do
    {
        if ( (i + j)%2 == 0)
        {
            printf("%d", i);
            printf("%d", j);
        }
        j = j + 1;
    } while(j <= 5);
} while(i <= 5);
```

3. (a) Write the definition of the following function in C : 3

$$f(x) = \begin{cases} x + 1 & \text{if } x < 5 \\ x + 2 & \text{if } 5 \leq x \leq 10 \\ 0, & \text{otherwise} \end{cases}$$

- (b) Explain the use of enum data type, with the help of an example. 2
4. (a) Assuming that the stack is empty initially, what is the status of the stack after each of the following operations ? 2
- push(A);
push(B);
pop();
push(B);
push(C);
pop();
push(C);
- (b) Declare a structure called “complex” that stores a complex number. Declare a variable of type “complex”, also write a function that takes a complex variable as a parameter and returns its modulus. 3
5. (a) Write a recursive function in ‘C’ to compute the factorial of an integer. 2
- (b) Write a ‘C’ program that reads an array of integers from keyboard and prints the number of integers divisible by 2 or 3. 3
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