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MMT-001

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

Term-End Examination

December, 2024

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

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

Maximum Marks : 25

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

1. Write the output of the following C codes.

Justify your answers with short explanations :

10

- (i) Void main()

```
{ int x = -1,y;  
    ++ x;  
    y = x ? 2 + x : 3 - x;  
    printf ("%d",y);  
}
```

- (ii) Void main()

```
{ int x = 2,y = 2,z = 2;  
    x = y == z;  
    y = z == x;  
    z = x == y;  
    printf ("%d",z);  
}
```

- (iii) Void main()

```
{ int a [ ] = {1, 5, 4, 3, 2, 8, 5};  
    int i, x = 0;  
    for (i = 0; i <= 3; i++)  
        x = (x + a[i] + a[6 - i]) / 2;  
    printf ("%f", x);  
}
```

(iv) `int fun (int n)`

```

{   int x = 0;
    while (x * x < n)
        x + +;
    return x;
}
```

`Void main()`

```

{ printf ("%d", fun (5) * fun (25));
}
```

(v) `int x[3][4] = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12};`

`Void main()`

```

{ int i, j;
  for (i = 0; i < 3; i++)
    for (j = 0; j < 4; j++)
      if (x [i] [j] % (i + j + 1) == 0)
        printf ("%d", x [i] [j]);
}
```

2. (a) Explain the difference between the `malloc( )` and `calloc( )` functions, with examples. 3

(b) Explain the output of the following C code : 2

`Void main()`

```

{ char str [.] = "EGNARO";
```

```
int i, temp, n = strlen (str);
for (i = 0); i < n/2; i++)
{
    temp = str [i];
    str [i] = str [n - i - 1];
    str [n - i - 1] = temp;
}
printf ("%s", str);
}
```

3. (a) Write a C program that takes a list of integers as input from the keyboard, and prints the mean and standard deviation of the data. 3
- (b) Define a C function to find maximum among the numbers entered by the user using variable length argument list. 2
4. Write a C function that takes a two-dimensional array with equal number of rows and columns as its arguments, and returns 1 if the array is a magic square and 0 otherwise. 5

(Note : A magic square is one in which sum of each row, sum of each column, sum of each diagonal are all equal.)

5. (a) Express the following expression in RPN
(Reverse Polish Notation) : 2

$$4 - 5 + 6/2 - 4 + 3 * 6$$

- (b) What is a structure ? What is a self-referential structure ? Explain. 3

x x x x x x x