2025

MATHEMATICS — HONOURS

Paper : SEC - 1

(C Language with Mathematical Applications)

Full Marks : 75

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Notations and Symbols have their usual meaning.

1. Answer ***any five*** questions : 3×5

(a) Write the output of the following C program :

```
#include<stdio.h>
main()
{
    int a = 5, b = 10, Result;
    Result = (a < b) && (b == 10);
    printf("%d", Result);
}
```

(b) What will be the output of the following C program? Give reasons in support of your answer.

```
#include<stdio.h>
main()
{
    int x = 3,  y = 2, z;
    z = (x ++) + (++ y);
    printf("z = % d", z);
}
```

(c) What is the difference between = and = = operators in C? Give an example.

(d) Identify the error(s) in the following snippet :

```
#include<stdio.h>
main()
{
    int x = 3
    if x > 0;
        printf("Positive");
}
```

(e) Write the following expression in C.

$e^{x^4+3\tan x} + \cot(x^3+7) + 5\sqrt{x}\sec(3x)$.

(f) What is the difference between **While** and **do-while** loops in C?

(g) Explain the concept of a **function prototype** in C.

2. Answer ***any five*** questions :

(a) Write short notes on Compiler, Interpreter, Machine Language and High Level Language. 2+2+2+2

(b) (i) What is the **output** of the following C code?

```
# include < stdio.h >
   int main( )
   {
   int a = 3;
   printf("%d%d",a, a ++);
   }
```

(ii) What is meant by an operator in C? Explain the functions of logical AND and logical OR operators. 3+(1+4)

(c) (i) Explain the use of **for loop** with an example.

(ii) Write a C program to find the sum of all even numbers between 1 and 30. 3+5

(d) (i) Describe the different relational operators available in C.

(ii) Write a program to read 20 integers from the keyboard and calculate their average. 3+5

(e) (i) What is an array? How do you initialize a 1D array?

(ii) Write a C program to find the maximum element in a given array of 20 numbers. 3+5

(f) (i) Compare the float and double data types in terms of precision and memory.

(ii) Write a C program to find the transpose of a 3 × 3 matrix. 3+5

(g) What is recursion? Write a function to evaluate factorial of n to show how the recursion works. 2+6

3. Answer ***any two*** questions :

(a) (i) Write a C program to check whether a given positive integer is a Perfect Number.

(ii) Write a program to read a list of 15 numbers and sort them in descending order. 5+5

(b) Write a C program that takes three real numbers a, b, c as user inputs, then identifies the nature of the roots of the quadratic equation $ax^2 + bx + c = 0$, and finally prints the roots of the equation.

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(c) (i) Write a program to find the value of

$$1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\frac{1}{9}-\ldots+\frac{1}{2025}$$

(ii) Write a C program to compute the value of $f(x)$ for x = 0, 1, 2, ..., 10, where $f(x)$ is defined as

$$f(x)=\begin{cases} x\cos x; & 0\le x\le 2 \\ xe^{x}; & 2<x\le 5 \\ \log_e(1+x); & x>5. \end{cases}$$

5+5
