

2023

MATHEMATICS — HONOURS

Paper : SEC-A-1 and SEC-A-2

*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.*

Paper : SEC-A-1

(C-Programming Language)

Full Marks : 80

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1. Each question below is followed by four possible answers of which exactly one is correct. Choose the correct answer with proper justification. 2×10

(a) What is the right way to initialize array?

(i) `int num[5] = {10, 14, 18, 25, 30}`(ii) `int n(5) = {10, 14, 18, 25, 30}`(iii) `int n{5} = {10, 14, 18, 25, 30}`(iv) `int n{} = {10, 14, 18, 25, 30}`

(b) What is the work of 'break' keyword?

(i) Half execution of program

(ii) Restart execution of program

(iii) Exit from loop or switch statement

(iv) None of these.

(c) The correct way to declare a two-dimensional array in C is

(i) `int[][]arr;`(ii) `int arr[][];`(iii) `int[]arr[];`

(iv) None of these.

(d) Which of the following is not a valid C variable name?

(i) number

(ii) rate

(iii) variable_count

(iv) \$ main

(e) How many times will the following loop execute?

`for (j = 5; j >= 1; j = j - 1)`

(i) 4

(ii) 5

(iii) 6

(iv) 0.

Please Turn Over

(f) What is the output of the following code snippet?

```
void main()
{
    int y = 4;
    int x = 9% 2 * 4/2;
    printf("%d", x);
    return 0;
}
```

- (i) 3 (ii) 2 (iii) 1 (iv) compile-time error.

(g) _____ is known as the translator for low-level programming language.

- (i) Compiler (ii) Linker
(iii) Loader (iv) Assembler.

(h) Which of the following is not an arithmetic operation?

- (i) $a *= 5$ (ii) $a /= 5$
(iii) $a != 5$ (iv) $a \% = 5$.

(i) Switch statement accepts _____.

- (i) int (ii) char
(iii) long (iv) all of these.

(j) Which of the following loops tests the condition after having executed the statement within the loop?

- (i) while (ii) do-while
(iii) for (iv) if-else-if.

2. Answer **any one** question :

(a) (i) What is a loop in C? Discuss the difference between while and for loops in C.

(ii) Write a C-program to reverse the digits of a given number. (2+3)+5

(b) (i) What will be the output of the following code snippet?

```
#include <stdio.h>
void solve()
{
    int a = 3;
    int res = a++ + ++a + a++ + ++a;
    printf("%d", res);
}
int main()
{
    solve();
    return 0;
}
```

(ii) Write a C program to print

a = 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
using for loop.

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4+6

3. Answer *any one* question :

(a) (i) How can you use *break* and *continue* statements in *for* loop? Give suitable example to justify your answer.

(ii) Write a C-program to find the arithmetic mean of n real numbers. (2+3)+5

(b) (i) Write a C-program to find the functional values for five given values of x , where

$$f(x) = \begin{cases} x^2 + \sin x, & 0 \leq x < 2 \\ 2 \cos x - 1, & 2 \leq x \leq 4 \end{cases}$$

and input values of x are 0.2, 1.8, 2.0, 2.5, 3.5.

(ii) Write C-program to find factorial of a given number using recursion. 6+4

4. Answer *any one* question :

(a) (i) What is local variable and global variable? Explain with suitable example.

(ii) Write a C program to input an array of numbers, store the square of these elements in an array and print it. 4+6

(b) (i) What do you mean by one-dimensional array? Give an example.

(ii) Using array, write a C program to sort a given set of numbers in descending order. (2+2)+6

5. Answer *any one* question :

(a) (i) Write three benefits of using functions. Distinguish between the user-defined function and the standard built-in functions.

(ii) Use `scanf()` and `printf()` to write a C-program to check whether three line segments form a triangle or not. (2+2)+6

(b) (i) Write short notes on (i) ALU, (ii) Decision making statements in C.

(ii) Write a C-program to find the transpose of a square matrix. 3+3+4

6. Answer *any one* question :

(a) (i) Write the following expression in C :

$$2^{x^3 + \sin x} + \log_e |1 + \sin x|$$

(ii) Using *for* loop, write a C-program to find sum of the squares of first 100 natural numbers.

(iii) Write a C-program to find the numbers between 100 and 200 which are divisible by 7. 2+4+4

Please Turn Over

(b) (i) Explain the two methods of passing parameters to a user-defined function in C. Give example for each.

(ii) What is the output of the following C-program? 6+4

```
#include <stdio.h>
void main()
{
    int i, j;
    for (i=1; i<5; i++)
    {
        printf("\n");
        for (j=i; j>0; j--)
        {
            printf("%d", j);
        }
    }
}
```

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7. Answer **any one** question :

(a) (i) State the differences between the declaration of a variable and the definition of a symbolic name.

(ii) What is do-while statement? Explain with suitable example.

(iii) Write a C-program to find the volume of a sphere of radius r. 3+3+4

(b) (i) What are header files in C? Name three header files in C giving functions of each.

(ii) Write a C-program to check whether a number is palindrome or not. (1+6)+3

Paper : SEC-A-2

(Object-Oriented Programming in C++)

Full Marks : 80

1. Each question below is followed by four possible answers of which exactly one is correct. Choose the correct answer with proper justification/explanation (whenever applicable) for your choice : 2×10

(a) The ability to declare different methods with same name in a class is known as

- (i) Recursion (ii) Overloading
(iii) Overriding (iv) Constructor.

(b) The packing of data and functions into a single component is known as

- (i) Encapsulation (ii) Polymorphism
(iii) Abstraction (iv) Inheritance.

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(c) Which statement gets affected when `i++` changed to `++i`?

- (i) `i=20; i++` (ii) `for (i=0; i<20; i++)`
(iii) `a=i++` (iv) `while (i++=count) count i.`

(d) C++ cannot be used to develop

- (i) Database (ii) Compiler
(iii) Editor (iv) Toolkit.

(e) Compute the output of the following :

```
#include <iostream>
using namespace std;
inline int find(int p, int q)
{return (p>q)? p : q;}
int main()
{cout<<find(4, 40) << "\n";
return 0;}
```

- (i) 4 (ii) 40 (iii) 0 (iv) 1.

(f) Class data {void select (void);
public: void delete (void);
data p;
p. select();}

find the incorrect line statement.

- (i) `void select (void);` (ii) `data p;`
(iii) `p. select();` (iv) `public: void delete(void);`

Please Turn Over

(g) `int p = 15, q = 37;`
`int *a = &p, *b = &q;`

What is true about execution of this code?

- (i) `p = q` (ii) `q = p`
 (iii) `a` points to `q` (iv) `b` points to `p`.

(h) 'Friend' functions in C++ are designed primarily for

- (i) Restricting the access of private members from outside of the class
 (ii) Accessing protected members of a class only from its derived class
 (iii) Accessing the private and protected data of a class from any other class
 (iv) All of the above.

(i) What is the difference between protected and private access specifiers in inheritance?

- (i) Private member is not inheritable and not accessible in derived class
 (ii) Protected member is inheritable and also accessible in derived class
 (iii) Both are inheritable but private is accessible in the derived class
 (iv) Both are inheritable but protected is not accessible in the derived class.

(j) A template class can have

- (i) More than one generic data type
 (ii) Only one generic data type
 (iii) At most two data types
 (iv) Only generic type of integers and not characters.

Unit - I

2. Answer **any four** questions :

- (a) What is object-oriented programming? Distinguish between data abstraction and data encapsulation in object-oriented programming. 1+4
- (b) Write a short note about the "istream" and "ostream" class in C++ program. 5
- (c) Write a C++ program to product two given 2×2 matrices using operator overloading. 5
- (d) Discriminate between `main()` function in C++ and `main()` function in C. 5

- (e) For a 32-bit system, what is the size of void pointer? What will happen when the following program is run? 1+4

```
#include <iostream>
using namespace std;
int main()
{
    int ar[6]={22, 5, 23, 43, 54, 65};
    int *p, i;
    p = ar;
    i = *p++ - *p--;
    cout <<i;
    return 0;
}
```

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- (f) Write a C++ program to calculate the HCF and LCM of 3 input positive integers using classes. 5
- (g) Define variables and constants in C++. Mention 3 rules for naming variables in C++. 5

Unit - 2

3. Answer *any four* questions :

- (a) Write a C++ program to display the reverse of a string. 5
- (b) List different forms of inheritance; also provide a suitable example for each. How many minimum number of classes are required to implement hierarchical inheritance? 2+2+1
- (c) Write a program to compare two fractional numbers by overloading the relational operators (`==`, `!=`, `>=`, `<=`). 5
- (d) What is constructor? Explain with the help of an example. What is the purpose of using a constructor in C++? 2+2+1
- (e) What is an inline function? Explain, how it is used, with an example. 2+2+1
- (f) What is encapsulation and data abstraction in C++? What are the purposes of using these? Mention one difference between these. (1+1)+(1+1)+1
- (g) What is polymorphism? Write a program to show the use of polymorphism in C++. 1+4

Unit - 3

4. Answer *any four* questions :

- (a) Write a C++ program to find all the prime numbers between 1 and N (N being a positive integer). 5
- (b) Write a C++ program that will ask for a temperature in Fahrenheit and display it in Celsius. 5

Please Turn Over

(c) Find errors, if any, in the following C++ statements :

5

(i) `cout <<"x=" x;`

(ii) `m = 5; //n=10; //s=m+n;`

(iii) `cin>>x; x>>y;`

(iv) `cout <<\n "Name :"<<name;`

(v) `/*Addition*/z = x+y;`

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(d) Distinguish between the terms class template and template class.

5

(e) Write the basic syntax of an Exception Handling block in C++. When is Exception Handling required in C++?

2+3

(f) Write the syntax for defining a namespace in C++. Write a program to demonstrate the need of namespace.

2+3

(g) What is a copy constructor? Mention its types. What happens if the user does not specify a copy constructor explicitly?

(2+2)+1
